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Are Your Emails Safe?

08 Are Your Emails Safe?

It's amazing how quickly people have become reliant on email. And even though social networks account for much of our informal communication these days, many of us use email for important things – including storing passwords and details for other accounts. Is that really a wise idea, though, especially in a time when hackers have been known to get into email accounts of businesses and release information? David Crookes reports

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With millions upon millions of Xboxes sold and the number one PC gaming OS under its belt, it's clear Microsoft knows a thing or two about gaming. It's not resting on its laurels, though. No, it has some exciting projects in the works, and we've been looking at what they are and what they'll mean for you

22 Microsoft Edge

Internet Explorer has been with us such a long time, it's hard to remember a time when it didn't exist. It seems weird, then, to think that it could be abandoned, but that's what's happening. Yes, Microsoft's once-dominant browser has reached the end of the road, and its successor has already been lined up, as David Briddock explains

26 Adblock Damage

Advertisers and the public have for many years had an uneasy relationship. Without advertising, free websites could not survive, so they're generally considered a necessary evil. Yet people will still go out of their way to avoid them, because they don't like feeling like they're being manipulated. As web browser extensions make ad blocking easier, are we slowly killing our favourite websites and heading towards a future of content behind paywalls?



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Microsoft Edge

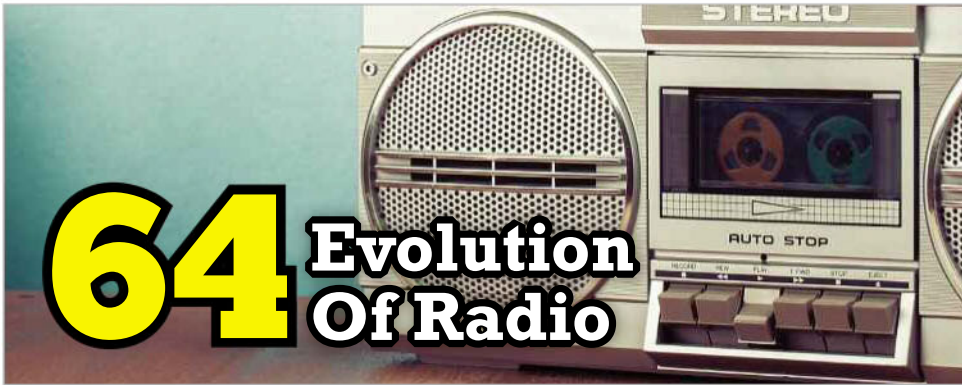


Adblock Damage

26



56 Lossless Music



64 Evolution Of Radio

56 Lossless Music

Much has been made lately Tidal and how, as well as costing quite a lot, it will also offer high-definition downloads that you can't get from services like Spotify. It's not the only service that offers such products, however. Join Roland Waddilove as he explores the music download companies that offer top-quality, uncompressed audio

60 Alternative ISPs

Ask a hundred random people on the street which ISP provides their broadband connection, and we'd be willing to bet most of them will say BT, Virgin Media, Sky or TalkTalk (unless you're in Hull). If you're looking to switch providers, and you want to go off the beaten track, then our guide to alternative ISPs might be just what you need

64 Evolution Of Radio

Remember when digital radio was released in this country and everyone went out and bought one immediately? And how within a year, the old analogue frequencies were switched? No, of course you don't, because it didn't happen. FM radio, in spite of being the old standard, remains with us to this day, but is its time nearly up? Turn your dials to page 64 and find out



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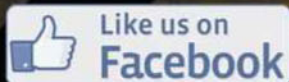
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Are Your Emails Safe?



David Crookes looks at the lax security of people's email accounts and how easy it is to hack them


Last December, the world became enthralled by the sheer number of emails that had leaked out of Sony Pictures. More than 170,000 internal missives involving some of Hollywood's top stars were opened up for all to see, and it was a highly embarrassing state of affairs that showed the extent of the politics that swirl around Tinseltown.

It got worse in April this year when WikiLeaks published an analysis and search system for what it calls The Sony Archives. With the public able to pore over the 173,132 emails sent to and from 2,200 email addresses, it's little wonder that actress Angelina Jolie and former CEO Amy Pascal are among those hopping mad at the breach. Yet something similar – if not quite so dramatic – could easily happen to you.

Email has been in common use since 1993 and, despite constant claims since then, it is as popular as it ever has been. Facebook and Twitter may have user figures running into the hundreds of millions, and we may see text messaging and Whatsapp as a viable alternative of sorts, yet some 85% of internet users continue to use email for communication – its ubiquitous nature and low technical requirements ensuring it remains attractive.

But with that brings the potential for danger. The core email technology has barely changed since the mechanisms for email were put in place around 1982 and, as we have seen, security can be lax. It's easy to fall prey to hackers, and so many people do. In America alone in 2014, the personal information of 100 million people was infiltrated and exposed according to the Ponemon

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SONY 

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(on 2015-04-16)

Press Release

Today, 16 April 2015, WikiLeaks publishes an analysis and search system for The Sony Archives: 30,287 documents from Sony Pictures Entertainment (SPE) and 173,132 emails, to and from more than 2,200 SPE email addresses. SPE is a US subsidiary of the Japanese multinational technology and media corporation Sony, handling their film and TV production and distribution operations. It is a multi-billion dollar US business running many popular networks, TV shows and film franchises such as *Spider-Man*, *Men in Black* and *Resident Evil*.

In November 2014 the White House alleged that North Korea's intelligence services had obtained and distributed a version of the archive in revenge for SPE's pending release of *The Interview*, a film depicting a future overthrow of the North Korean government and the assassination of its leader, Kim Jong-un. Whilst some stories came out at the time, the original archives, which were not searchable, were removed before the public and journalists were able to do more than scratch the surface.

Now published in a fully searchable format The Sony Archives offer a rare insight into the inner workings of a large, secretive multinational corporation. The work publicly known from Sony is to produce entertainment; however, The Sony Archives show that behind the scenes this is an influential corporation, with ties to the White House (there are almost 100 US government email addresses in the archive), with an ability to impact laws and policies, and with connections to the US military-industrial complex.

WikiLeaks editor-in-chief Julian Assange said: "This archive shows the inner workings of an influential multinational corporation. It is newsworthy and at the centre of a geo-political conflict. It belongs in the public domain. WikiLeaks will ensure it stays there."

Sony is a member of the MPAA and a strong lobbyist on issues around internet policy, piracy, trade agreements and copyright issues. The emails show the back and forth on lobbying and political efforts, not only with the MPAA but with politicians directly. In November 2012 WikiLeaks published a secret draft of the *Trans-Pacific Partnership* (TPP) impact with Michael Froman, the US Trade Representative. DotCom from New Zealand as part of SPE's war on piracy.

The connections and alignments between Sony Pictures Ent...

Archives 2006-2010

- Afghanistan
- Albania
- Algeria
- Andorra
- Angola
- Antigua
- Antigua and Barbuda
- Argentina
- Armenia
- Australia

Editorials

- 2015-02-06
Assange considers law suit against UK Deputy Prime Minister
- 2015-02-05
Sweden Tells the UN that Indefinite Detention Without

“ Core email technology has barely changed since the mechanisms for email were put in place ”

Institute. A good number of email accounts were compromised as a result.

Getting Into Accounts

In spite of all this, on the whole, we tend to do very little to protect ourselves. Emails pop into apps on our phones and iPads, and messages to pour into unprotected software on our desktops. If we walk away from those devices without locking them, then by and large anyone can quickly sneak a peak at the contents. But the problem runs deeper than someone taking a mere nosy glance. Our emails are being preyed on daily by hackers determined to access the goodies inside them, and even though it is possible to take steps to halt many of these advances in their tracks, too many criminals are simply being waved through because we're not taking enough care.

One of the biggest mistakes people make when it comes to email is over-relying on anti-virus software. Viruses and malware can infiltrate computers, with keyloggers making a note of what you're typing into password boxes. Yet good anti-virus apps will typically only protect emails from problems that have existed for a long time. They will not protect against zero-day attacks, system threats and the thousands of new viruses that are released each

Tip: Create Difficult And Different Passwords

Make sure your password is different to any other that you currently use. That way, if one of your accounts is compromised, it should prevent others from falling too.

At the same time, ensure your passwords are as uncrackable as possible. Experts used to recommend a complex password using different letters, numbers and punctuation, but they found people often forgot them. As a reminder, they would make a written note – leading to a another security vulnerability.

The best approach is to form a lengthy password that you can store in your head and remember. Short, complex passwords add little to the time it takes to crack, but a mix of upper and lowercase letters in a long password increases the time by a factor of 26 for every extra character.

So aim for between 12 and 14 characters, which experts say it can take a computer as long as 15 years to uncover.

If you want to test various passwords for their robustness, play around at sites such as howsecureismypassword.net (but don't input your real password).

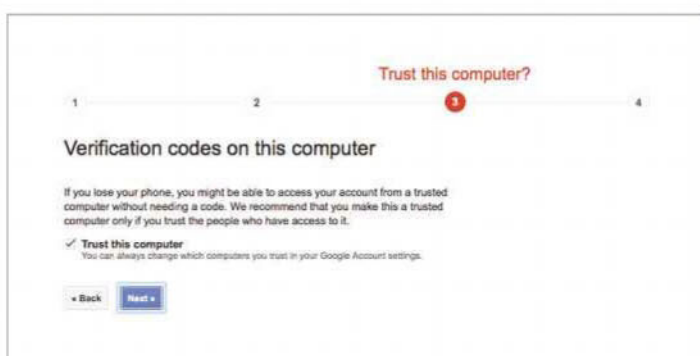
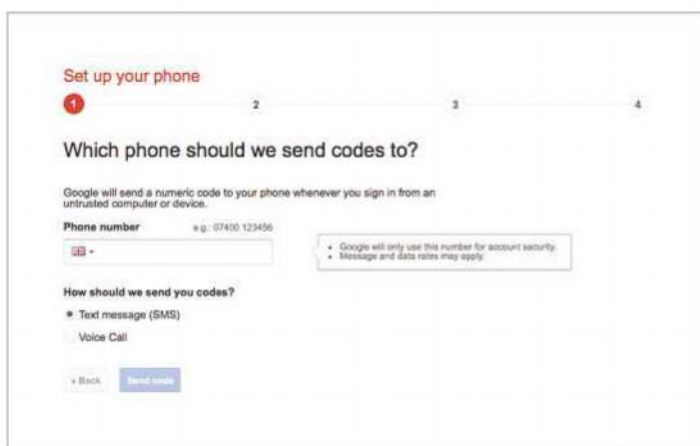
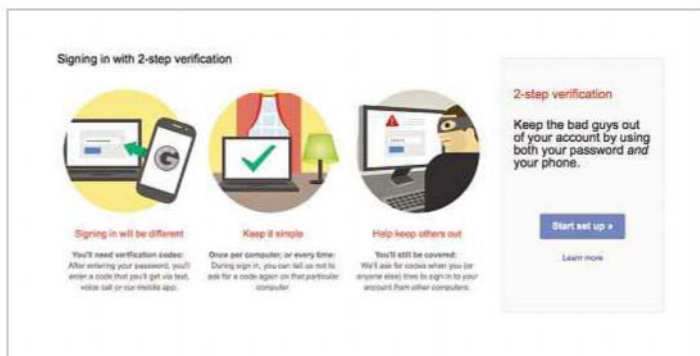
Tip: Have Three Email Addresses

Use one email address for your important communications such as for banking and sensitive account or booking information. Never give this address out to anyone unless you really have to. Have another email address for friends and family – a general email that is used for day-to-day communications and which will only see non-sensitive information passing in and out. Then have a third that you use to sign up to all manner of less important websites: one that you rarely have to check and which is throwaway. Ensure that if this is compromised, it would contain such low-level information that you wouldn't bat an eyelid and could just simply set up a new one and carry on.



day online (Kaspersky Lab detected 315,000 new malicious files every day, and it says 41.6% of user computers have been attacked at least once).

Neither will they protect from basic human error. Even though the single biggest vulnerability that people face is the fact their email addresses are stored on remote servers (on retail sites, on social media databases and so on), too many of us fail to protect ourselves from possible breaches. "When you sign up to Amazon, you give an email address, so if Amazon is hacked, your email is toast and could potentially be disclosed," explains John Douglas, a digital forensic specialist for First Response. And this is more common that it should be. We've seen breaches of the PlayStation Network during which email addresses, birth dates, names, addresses, countries, usernames, passwords and online handles were stolen. Amazon and what used to be Play.com have suffered security breaches and been sent spam emails. Dating website eHarmony and the business social network LinkedIn have also fallen prey to password hackers, and it's clear it's a problem that refuses to go away. It has led to worry among users and lots of inconvenience, not to mention a flurry of phishing emails which attempt to capitalise on the problem.

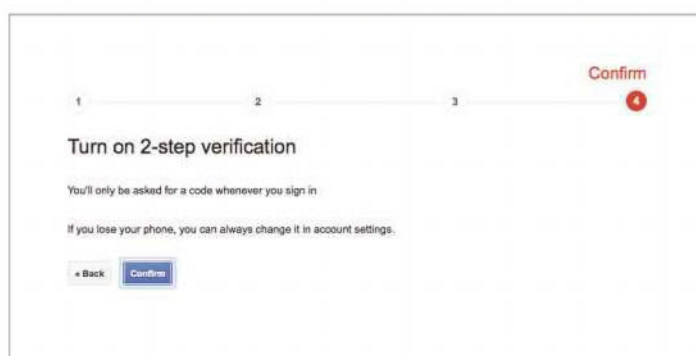
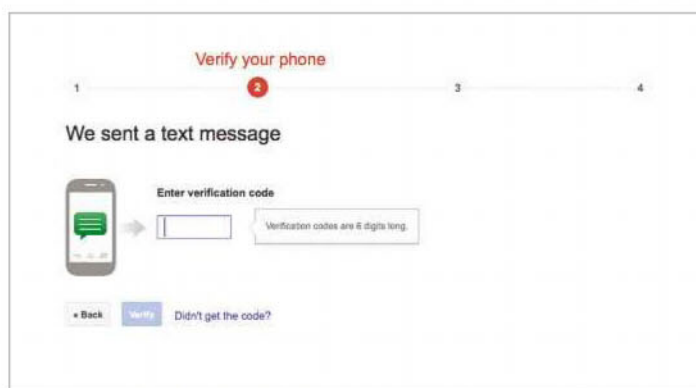


Tip: Set Up Two-factor Verification In Gmail

Many email services will allow you to use two-factor verification. When you turn this on, every time you log into using your password, a code will be sent to your phone that you also have to input. It makes your email account extra secure because a hacker would not only need knowledge of your password but access to your phone in order to get in.

To make life easier for yourself, you can tell the email provider that you want it to trust certain devices. By doing this, you can continue checking and writing emails without needing the SMS code on your own machines. But if someone – including you – attempts to get into the account on a non-verified computer or device, it will ask for the code. Without it, access is barred – a perfect stranger deterrent.

1. Go to www.google.com/landing/2step, and Click Get Started. It will ask you to sign into your Gmail account and then take you to another landing page. Click 'Start set up'.
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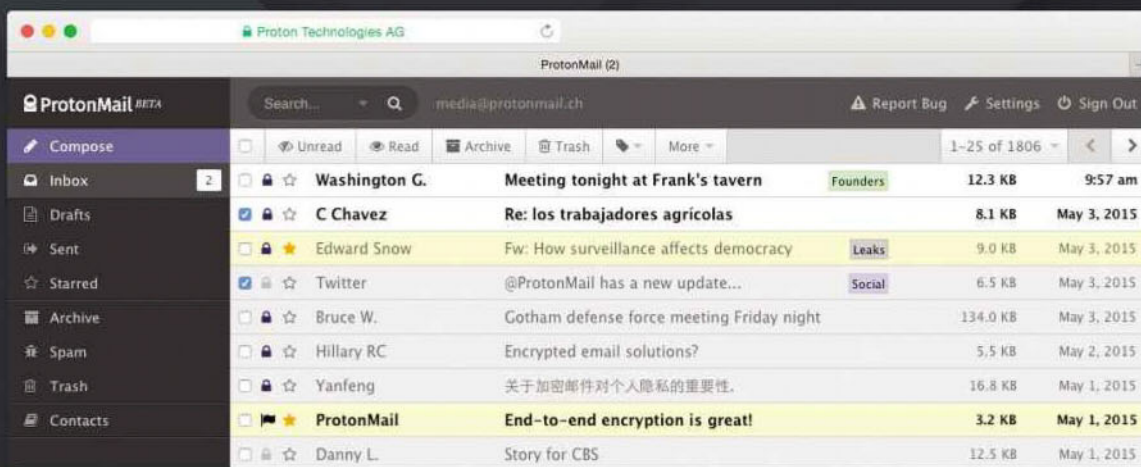
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“When the databases of companies are targeted, very often people’s email addresses are in the database,” says Douglas. “That doesn’t necessarily mean that an email address can be compromised, but when those databases also have usernames and passwords stored, there’s a problem.”

“Users tend to be lazy and they use the same password for various things. So hackers could obtain their email address and, in a disparate part of the record, their login details for the system that has just been compromised. They then have a password. It’s not a great stretch to imagine that 60 to 70% of the users in that database are going to use the same password for their emails as they do the login for that website that has been compromised. That gives hackers the potential ability to access an email account.”

Seek Protection

It’s crucial that we secure our email accounts adequately. One of the major issues with the Sony Pictures hack was that security was poor. The studio pinned the blame on software flaws and said its technical staff failed to see that those being targeted were being tricked into revealing their online credentials. Yet it also found that staff were using passwords that were too easy to guess – and this, experts have long agreed, has left so many email accounts vulnerable over the years.

“The number of people who use ‘changeme’, ‘password1’ or their favourite football team for their email accounts is startling,” says Douglas. “If you do a quick Google search on the top 100 passwords, you will find various security researchers who have downloaded the database of user accounts, reverse engineered them and looked at the passwords stored. They have determined

that an extraordinary number use ‘password123’ – around 30% of the 50 million accounts compromised use that one password. It’s ridiculous.”

But even if you do not use such an obvious password, John Pozadzides, the CEO of web company iFusion Labs, says he could get into your system regardless. He explained at Lifehacker.com that he would try a partner, child or pet’s name first, followed by a 0 or 1, a date of birth, a string of numbers, ‘letmein’, ‘god’, ‘money’, ‘love’ or, as Douglas explained, a football team or the word ‘password’. But if that doesn’t work – and he says it would for 20% of people – then he would try a brute force attack, using a piece of software that tries to access an email account by trying lots of commonly used passwords until it finds the right one. Just like burglars, if someone wants to get in badly enough, they will, but you still have to do all you can to stop them.

“There are so many credential databases kicking around on hacker forums and various other locations on the darknet,” says Douglas. “The simple thing is to change your password reasonably often although not to the point where it’s a pain in the bum. Just make sure it is unique.”

Cracked Open

The danger of someone accessing an email account is stark. At the lowest of levels, someone would be able to send other people spam using a hacked account, but as you go up the ladder of vulnerability, your entire life could be laid bare. One of the most common things a hacker will do with a compromised account is search for ‘password’. This would usually bring up emails that contain the login details of numerous accounts, since many

people don't delete them. Even if the login details don't work, the hacker will know that the email address is tied to a particular service. By going to a website and selecting 'Forgot Password', it would be very easy for them to reset it, gain access and lock you out.

When used with sites like Amazon, this could prove to be a financial disaster, since the retail sites tend to have so much information about you – including a home address – and it would enable them to be able to make purchases. But even if a hacker is not interested in going that far, any poking around in emails can unleash information that you may not want prying eyes to see.

"I've seen email accounts compromised because someone has wanted to read the email activity between the person

“ There are so many credential databases kicking around on hacker forums ”

compromised and another third party – maybe juicy details about a merger or acquisition. Very valuable data in the wrong hands," says Douglas. "This kind of thing is less common for Joe Home-User, but there have been instances of a suspicious spouse gaining access to emails. By and large, though, email is a conduit to attack a system and get greater access to vulnerable and valuable data."

Email As A Storage Device

One of the problems is that so many people use their emails as a place to store lots of important information so they have it to hand wherever they are. Do you want to remember a reference number or access an application form next week? Email it to yourself. Do you need to refer back to those FTP details that a company has sent you for those articles? Leave them in your inbox. How about those scans you took of your bank statement on your phone that you wanted to see on your computer? Email them. But did you remember to delete them afterwards? No?

Even though there are lots of services that can take the place of emailing – from Dropbox to SkyDrive to iCloud – email is too often viewed as a massive, almost limitless depository for all the digital items that are accumulated throughout life. But email is not meant to be a database. It's supposed to be for communication. By leaving vital information in the inbox, you could end up watching helplessly as someone rifles through all of your various files and builds up a massive picture of you. It's akin to having a filing cabinet packed with important paperwork and letting someone loose on it.

Watch What You Type

But even if you lock down your emails, use different passwords, always log out when you're on a public server, employ two-factor authentication (see boxout) or delete sensitive emails and keep on top of all your mailboxes, your emails are not entirely safe. Privacy is a major issue and more so today. There has already been suspicion that government

Hacked Off

John Douglas, a digital forensic specialist for First Response, discusses the wider security issues surrounding email.

Micro Mart: How vulnerable are our emails to large-scale hackers?

John Douglas: What we see a lot is a particular set of attackers – be it a nation state or a large criminal organised network – targeting an organisation because there's a particular piece of intellectual property or some other property that they want. When a user clicks on a email, which looks interesting to him or her, it often has a weaponised attachment, typically a PDF. Once it is clicked on, it is not just their email account that is compromised but the system and the entire network they're connected to. That's when it becomes more of an issue.

MM: What do you do to help tackle this?

JD: We carry out intelligence gathering exercises for various agencies and perform open-source investigations against some of the admin in a network that we want to try to compromise. We do it as a penetration test or a white hat service, not maliciously obviously. We'll make some determinations, maybe pretending to be a jobseeker speaking to HR and asking who's in charge of IT. We get the email address of the person of interest, and then we do some open-source intelligence gathering, looking for their hobbies, at their LinkedIn profile and their Facebook profile if they have one. We have a number of profiles we can use to befriend them and become part of the inner circle and see whatever we want to see on that profile.

MM: What are you looking for?

JD: If we find out someone with a interest in remote control helicopters, we can go to a website that sells them and get a PDF of their current catalogue. We can then send that to them in an email that looks like it has come from a real vendor, bundling it with some malware to get access to their network.

MM: Does this kind of thing happen often for real?

JD: Oh yes, that social engineering attack is very typical of current phishing attacks on corporate and large corporate users but just as effective on home users and people part of small businesses as well. In many cases, small businesses have fewer resources and one guy who's head of technology, who's also looking after the servers but it's not his specialism, and he's probably not completely up to speed with the latest threats.

MM: Is a lot of hacking down to human error?

JD: It's not difficult to engineer information out of people. A colleague was engaged by the CTO of an investment bank in the City of London, and the success of the job was measured on his ability to send an email from the CTO corporate account to his personal account. He said he was going on holiday for ten days on a Friday and would leave at lunchtime, and that is when the exercise would start. It took my colleague seven minutes to access and send an email using just a mobile and a laptop computer. He called the main switchboard of the company and said he was the CTO, on holiday and needing to be put through to the helpdesk. The operator did so and told the helpdesk person it was the CTO on the line and asked him to take the call urgently. The helpdesk guy was teed up, believing the call was authentic. The fake CTO said he had just got a brand new laptop but he had no way of accessing his emails remotely. Over the course of five minutes, the engineers set him up with VPN access to the corporate account network, reset the email password and gave all of the credential details required. My colleague accessed the email account and sent a message.



OpenPGP Alliance

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About OpenPGP

OpenPGP is a non-proprietary protocol for encrypting email using public key cryptography. It is based on PGP as originally developed by Phil Zimmermann. The OpenPGP protocol defines standard formats for encrypted messages, signatures, and certificates for exchanging public keys.

Beginning in 1997, the OpenPGP Working Group was formed in the Internet Engineering Task Force ([IETF](#)) to define this standard that had formerly been a proprietary product since 1991. Over the past decade, PGP, and later OpenPGP, has become the standard for nearly all of the world's encrypted email.

By becoming an IETF Proposed Standard ([RFC 4880](#)), OpenPGP may be implemented by any company without paying any licensing fees to anyone.

The OpenPGP Alliance brings companies together to pursue a common goal of promoting the same standard for email encryption and to apply the PKI that has emerged from the OpenPGP community to other non-email applications. OpenPGP Alliance members do not have to feel that they are going it alone. They can be encouraged by the power of their numbers, to be visible to each other and work together toward a common goal, making each other stronger in the face of competing email encryption standards and competing approaches to building a Public Key Infrastructure. All this helps demonstrate to decision makers in the industry that OpenPGP really is the leading standard.

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OpenPGP Alliance

agencies have been reading people's messages. Indeed, GCHQ was revealed to have been capturing the emails of journalists at the BBC, the *New York Times*, the *Guardian*, *Le Monde* and the *Sun*, among others. But this is looking to set to become even more of an issue.

Within 24 hours of winning the general election, the Conservative government was reportedly looking at new laws allowing the security services to monitor people's email, internet browsing, phone calls and text messages. Home Secretary Theresa May's plan has been dubbed the 'snoopers charter' and it's a revival of the proposals that had been blocked by the party's former coalition partners, the Liberal Democrats.

People will need to be more careful about what they write in emails in the near future given that they could potentially be infiltrated, with the government able to ask for details going back 12 months. The new laws may even make encryption illegal. Encryption currently allow you to send an email that can only be read by the specified recipient – anyone infiltrating it in between will simply get gobbledygook. But the likes of Protonmail.ch, which provides a secure email solution, and Sendinc, which allows you to download Microsoft Outlook and Gmail add-ons, could be rendered useless and unlawful. Even if you have nothing to hide, the paranoia these laws will cause will almost certainly impact our relationship with email.

But that brings us to our final point when it comes to emails: current legalities. Emails can be as safe as possible to send, receive and keep, yet you still need to take care about what you're actually writing. Composing an email isn't a lesser form of letter writing and it holds just as much weight as the physical form. You should always bear in mind that emails can be forwarded to others in seconds and that they can be admitted as evidence in court, although legal experts say their reliability can be questioned.

According to Out-Law.com, "Just as email can be used to support a case, it can also be used to undermine it." It goes on to say, "email is something of an informal medium, and individuals may often write things in an email that they would not include

“ You should always bear in mind that emails can be forwarded to others in seconds ”

in a standard letter or memo. For example, individuals may send emails to each other discussing problems with a project and may make admissions of fault that they would not have made had they been aware that such emails could be disclosed to the other party. Policies regulating the use of email are therefore important." It's worth checking out a company's policy on email before you go about making wild claims, admitting things or writing nasty notes about that person in accounts.

All of this should encourage you to reassess the way you work with emails. There are some simple tips such as not opening attachments from people you don't know, using encryption software such as OpenPGP, using Bcc rather than Cc so that spammers are unable to grab large lists of names, using strong passwords and deleting sensitive emails. But at the back of your mind, you should always be wary that someone may be watching or that the recipient won't do the right thing with your message. "You have to be smart," says Douglas. [mm](#)

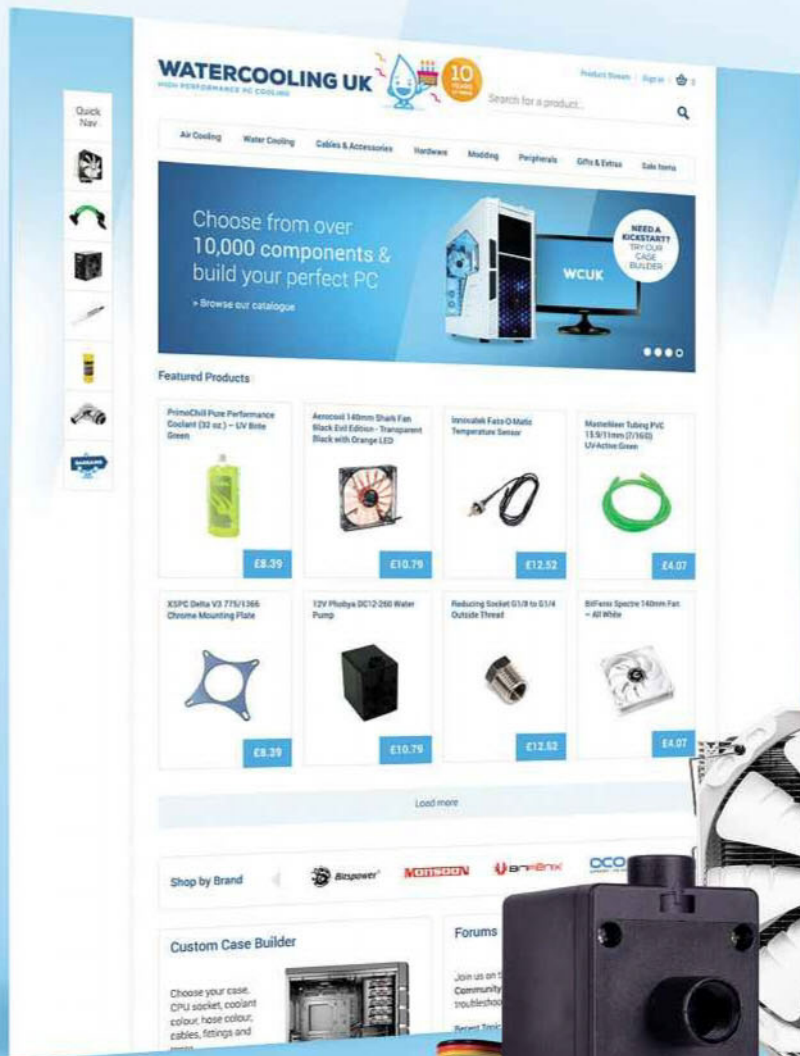
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MICROSOFT RESEARCH

Gameplay

David Briddock explores some thought-provoking applications of gameplay

In this series, we're uncovering some of the most interesting and innovative technology projects from Microsoft Research lab teams across the globe. This time the theme is gameplay and its many facets.

3D Body Avatars

Creating your very own customised avatar is an attractive proposition. Unfortunately, despite the huge advances in computer graphics technology, it's still a pretty involved and complex process. However, the BodyAvatar (goo.gl/ZNvVUN) team believes it has a solution that opens up avatar modelling to the masses.

The BodyAvatar project's main aim is to deliver an intuitive, naturalistic modelling interface based on Microsoft's popular and amazingly flexible Kinect technology. Here the key element is the Kinect's cameras and image processing software, which can capture and then analyse a player's body movements. It's these movements that are used to morph the player's body shape in three dimensions and consequently craft an infinite variety of avatar forms.

However, currently it does involve an extra component. Look carefully at a demonstration video and you'll notice that the

player wears a pair of reflective gloves. These special gloves are necessary to enhance the gesture recognition capabilities of the Kinect system's image processing software (though the final version may be glove-free).

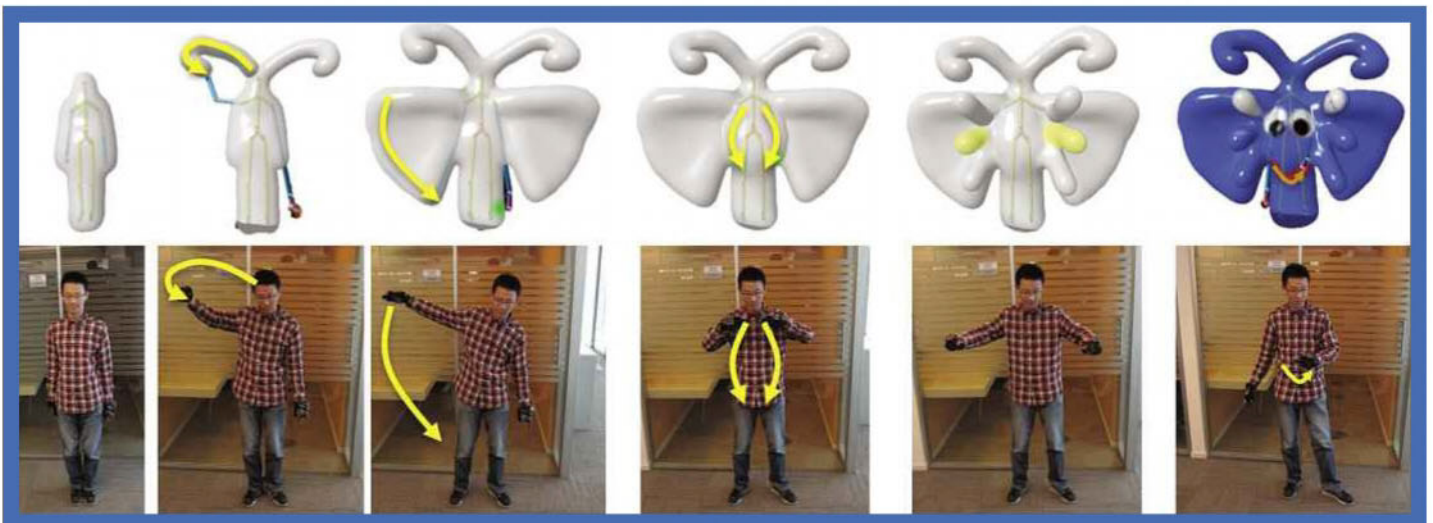
The BodyAvatar application allows anyone with a suitable Kinect system to morph into a soaring bird of prey, a gentle butterfly, a fire-breathing dragon, an intimidating looking alien or whatever creature resides in their imagination.

Strike A Pose

So how does it work? In practice, the whole modelling process involves three main steps. Firstly you strike a pose, any pose you like. This pose is scanned in via the Kinect hardware and becomes the avatar's base form.

Next, this initial form is manipulated, through simple arm gestures, to create a more complex form with smooth contours. BodyAvatar manipulation gestures are translated into drag, sculpt, scale and cut operations. So, for instance, you could enlarge the head, create more arms and legs or add wings.

Once you've defined your avatar's body shape and size, it's time to apply a splash of colour. And, as you've probably guessed by



now, it's all done though gestures in front of the Kinect camera. On the screen you'll see a colour palette. Just select the colour you're after and paint away: eyes, scales, patterns, camouflage or whatever your creative impulses suggest.

If you'd like to see BodyAvatar in action, there are a number of videos posted on the project's website (goo.gl/ZNvVUN).

Game-based Learning

At the Games for Learning Institute, they like to think differently about gameplay. In essence it's all about empowering the education community with software tools, which can teach in new ways, create interactive and truly compelling learning-focused content, and that not only capture and analyse the patterns of a student's study progress, but also provide helpful and incentivised feedback.

Within Microsoft, there's a strong desire to build technologies that bridge languages and cultures in ways that help people worldwide to communicate with and learn from one another. It's no surprise, then, to discover language education features highly on the game-based learning to-do list.

For many adults, learning a second language ends up becoming an arduous endeavour rather than a fun activity. Microsoft aims to change this by weaving language-learning experiences into the fabric of our everyday lives.

As Microsoft says, "We are especially interested in how micro-learning – learning in fragments of free time throughout the day – can provide a more convenient, contextual and learner-driven alternative to traditional classroom teaching."

To achieve this, the gameplay is broken down into numerous fast-action rounds of micro-learning, where players are engaged by stimulating their auditory, kinaesthetic and visual senses. These rounds are repeatedly played as and when free time slots appear.

Tip Tap Tones

A prime example is the Tip Tap Tones app for Windows Phone, which helps students learn the key sounds of Mandarin Chinese through gameplay.

Mandarin Chinese is known as a tonal language, where the meaning of a sound is inferred by both its changing pitch and the context of its use. Training the ear to distinguish each separate

tone in languages like Mandarin is a significant challenge for students.

Tip Tap Tones encourages tonal mastery through a collection of microgame challenges. To play, a player must listen carefully to a Mandarin sound, then tap an on-screen button, which they think represents the appropriate tone and syllable.

In the beginning, players are presented with just a single syllable and only four tone options to choose from. But as students begin to respond correctly, the sounds themselves become faster and the number of syllable options to select is increased.

The gameplay goal is to complete as many tonal game screens as possible in 60 seconds, while also achieving a personal best tone recognition score.

Polyword Flashcards

While Tip Tap Tones is a fun way to retrain your brain to identify foreign language sounds, a game called Polyword Flashcards is aimed at motivating vocabulary learning. The trick is to make it more relevant to everyday activities.

Polyword Flashcards is yet another example of a skill-based microgame. The gameplay challenges players to recall a set of vocabulary translations from a previously chosen subject. Each flashcard has a set of badges representing language skills, which are linked to microgames that test the player's ability and knowledge.

Yet to be fully effective, a microgame vocabulary learning format needs to be simple to use and available at any time and in any location. With the MicroMandarin microgame installed on your smartphone, you can recall words and phrases such as 'soy sauce' and 'chopsticks' while actually seated in a Chinese restaurant.

“ BodyAvatar manipulation gestures enact drag, sculpt, scale and cut operations ”

An early version of Polyword Flashcards is available as a free download in the Windows Phone marketplace (goo.gl/XiNpP7). It supports 19 languages and 42 voices, and you're able to set a different voice/language combination for front and back of the flashcard. There are millions of searchable card sets available online at on quizlet.com and cram.com.

Polyword Flashcard technology is already driving innovation in other Microsoft products and services. For instance, its adaptive flashcard-algorithm is currently in use for the flashcard component of Bing Dictionary Desktop (albeit Chinese-only for now).

Pex4Fun

Acquiring programming skills isn't the easiest task for students or their teachers, but Microsoft thinks its Pex4Fun (pex4fun.com) project can help.

Pex4Fun delivers an easy-to-use, browser-based teaching and learning environment for programming and software engineering courses. The material presented is largely aimed at those taking their first coding steps, but there are some advanced level topics too. Students are presented with a series of puzzles and interactive 'Coding Duels'. Currently, the website offers these puzzles in three Microsoft-centric coding languages: Visual Basic, C# and the functional F#.

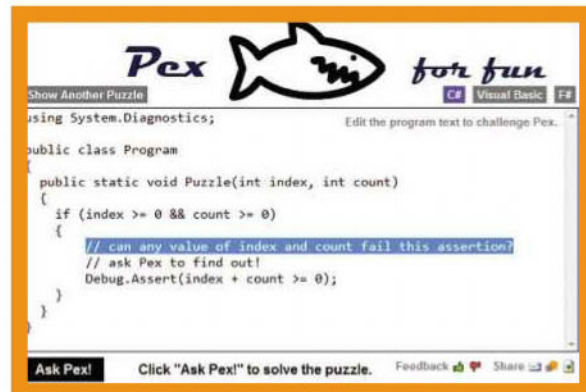
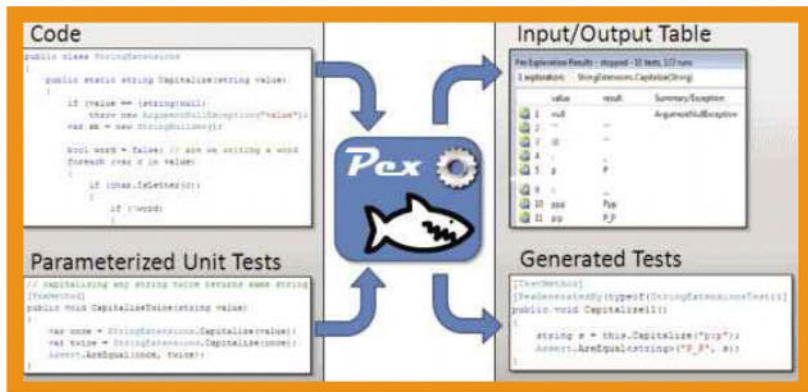
As for teachers, they can sign into the Pex4Fun environment and create a virtual classroom, modify an existing puzzle/duel or generate a brand new one. To help get started, there's a puzzle template for each supported language.

Under the covers, the Pex4Fun platform has an automated student grading engine, based on symbolic code execution statistics.

Actually, Pex4Fun isn't totally new. It's a simplified version of a downloadable desktop application called Pex (goo.gl/T9GJAX).

As you'd expect from a desktop app, Pex is a much more powerful and comprehensive code-learning solution than





the online-only Pex4Fun. Installed on a Windows PC, the Pex application is designed to integrate with Microsoft's Visual Studio development tool.

Stroke Recovery With Kinect

The potential of Microsoft's hugely popular Kinect system hardware reaches far beyond the gaming community. One particular Microsoft Research project is looking at its patient rehabilitation capabilities.

Eric Chang (senior director of tech strategy) and Miran Lee (principal UR manager) have developed a system to help stroke patients improve their upper-limb motor function in the comfort of their own home. The work-in-progress prototype system recognises and interprets the user's gestures, assesses their rehabilitation progress and adjusts the level of difficulty for

Azure Cloud for overall trending and performance analysis, or as a source of machine learning data.

The organisation FightTheStroke.org is an early adopter of the prototype system, and it has become a key component in children's stroke rehabilitation therapy. Virtually connecting two kids and giving them similar challenges means they can watch and learn from each other. It's a concept known as 'mirror neurones', where patients model the physical movements of another to strengthen their own connections.

FightTheStroke.org is running a pilot program with Columbia University in New York, which involves conducting remote rehabilitation sessions with home-based patients. Apart from the obvious social and family benefits, this virtual approach to therapy is also expected to deliver significant cost benefits. [mm](#)

“ Tip Tap Tones encourages tonal mastery though a collection of microgame challenges ”

subsequent therapy sessions. In this way, it evaluates a patient's coordination, manual dexterity and motor skills. The fun part is that patient therapy exercises are presented in the form of an asteroid-avoidance, outer-space game.

How does it work? Well, they chose a Kinect v2 system to be the technology foundation of this interactive rehabilitation system. The Kinect sensor's three-dimensional camera is used to capture the movements of 48 skeletal points on the patient in real-time, while the patient performs their therapy exercises.

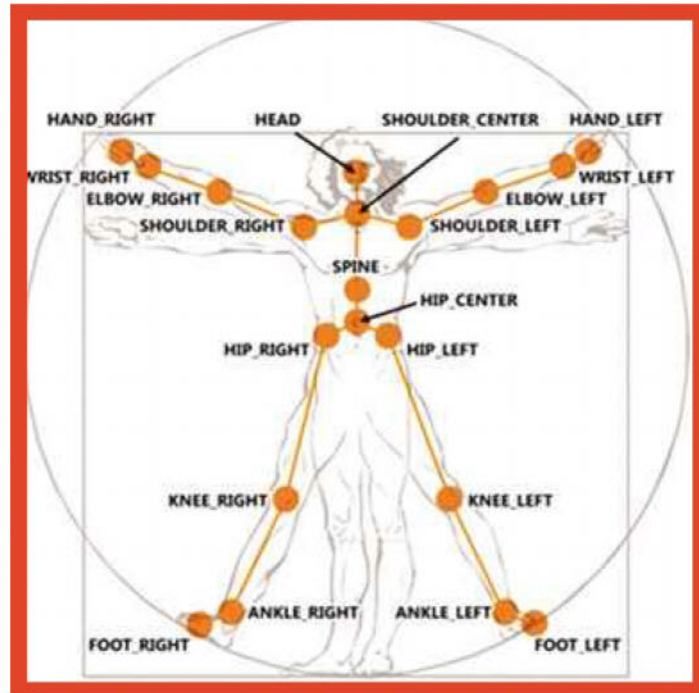
Meanwhile, specially written Stroke Recovery software interprets sensor data and measures the patient's movements. The resulting information helps the doctor assess the patient's rehabilitation progress. And the scores from previous sessions are used to adjust the level of difficulty for subsequent therapy sessions.

Employing a game-based approach means patients can receive continual feedback while performing the exercise programme. In addition a more formal Fugl-Meyer Assessment score is generated at periodic intervals.

Future plans include a data communication link back to the doctor or hospital, plus social networking integration, to enable patients to optionally participate in joint rehabilitative programs. There's also a move to store anonymised data in the Windows

Links

- Body Avatar project: goo.gl/ZNvVUN.
- Language Learning Games: goo.gl/EDvoOB.
- Pex4Fun: pex4fun.com.
- Pex desktop app: goo.gl/T9GJAX.
- FightTheStroke organisation: FightTheStroke.org.
- Kinect Windows SDK: goo.gl/7U2QPf.



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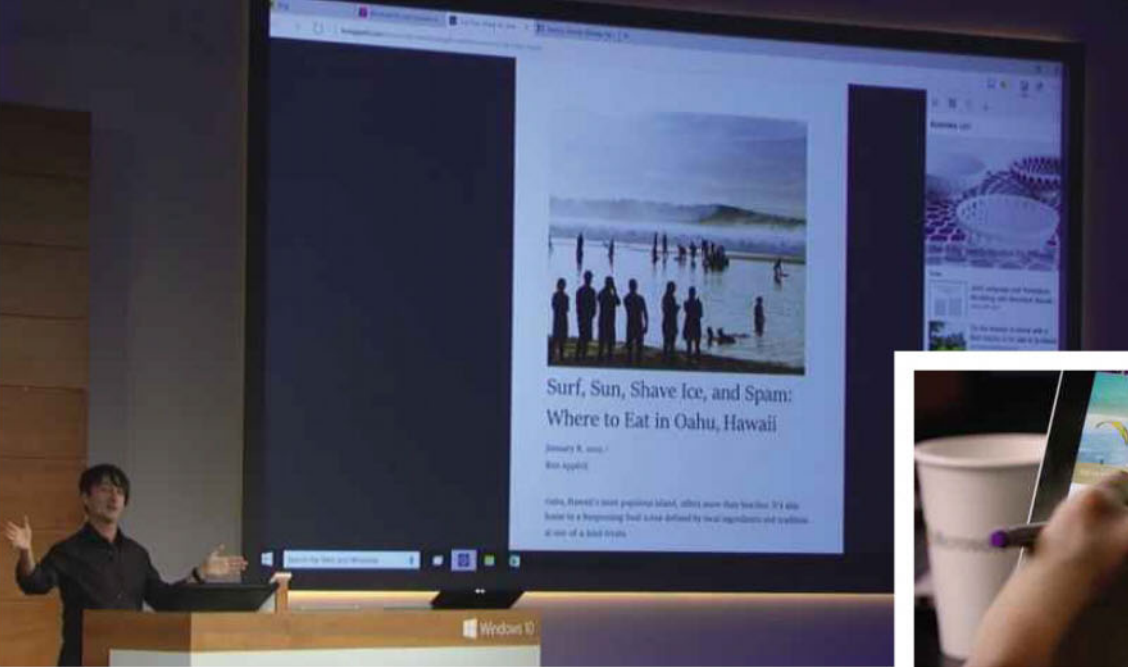
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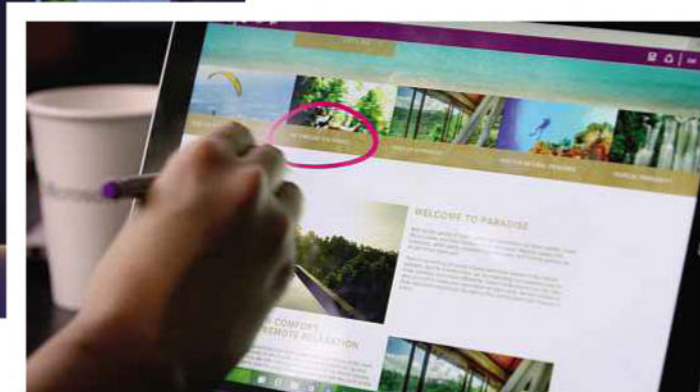
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◀ Project Spartan launch

▼ Edge Inking



Microsoft On Edge

David Briddock examines Microsoft's all new browser technology for the web generation

At the end of 2014, the web was buzzing with rumours about a new browser technology destined for Windows 10. At the time, though, Microsoft declined to confirm these rumours.

However, on 21st January 2015 at a Windows 10 news event, Microsoft shared details about its Project Spartan initiative. Since January there's been a steady flow of information about why Microsoft decided to build a new browser, the features on offer and how it compares and contrasts with Internet Explorer 11.

But before we start, let's first take a quick trip down memory lane.

IE History

Microsoft's Internet Explorer (IE) browser has a long history. In fact, August 2015 marks its 20th anniversary. Over this period, it has been a mainstay of every Windows desktop OS release and has appeared on the Apple Macintosh, Unix, Windows CE, Windows Mobile and Windows Phone platforms.

Yet the very first version didn't arise from the hands of a Microsoft development

team, but was instead a modified Spyglass-licensed version of the National Center for Supercomputing Association's Mosaic browser product. Spyglass was acknowledged as the licensor for the IE browser code until IE 7.

IE 1.0 was launched in August 1995 as part of the OEM release of Windows 95. It also became a component of the Microsoft Plus add-on pack for Windows 95. A little later, IE 1.5 added basic support for table rendering. It's this version that first appeared on Microsoft's business-focused Windows NT platform.

As the early web gained momentum, a flurry of new standards such as cookies, SSL and VRML accelerated the pace of browser development. Yet there was also a race to deliver the best web browsing experience, a key marketing driver in order to attract the fast growing numbers of internet-savvy consumers.

IE For Free

In April 1996, Microsoft released IE 2.0 for both Windows 3.1 and Mac. But the most significant moment in web browser history

came later that same year when, under pressure from rival technologies like Netscape Navigator, Microsoft released the free-of-charge 3.0 version.

The free-to-all tactic was all about gaining market share, and it worked like a dream for Microsoft. As the years went by and the releases kept on coming, IE's market share soared. Consequently, most of IE's rivals fell a long way behind, and some even ceased trading altogether.

However, nothing lasts forever. And by 2006, despite all those years at the top, IE has been steadily losing its dominant market position. By 2012, IE had been overtaken as the market leader by the relatively new Google Chrome browser. And with only around 20% of the browser market, IE struggled to fend off competition from Mozilla's Firefox and Apple's Safari.

Now Microsoft has decided it's time to replace its IE technology. So let's explore what's destined to be the default browser experience for anyone running Windows 10 on their desktop, laptop, tablet or smartphone.

Links

Edge home: modern.ie
 Current status: status.modern.ie
 Website testing: remote.modern.ie
 Testing tools: modern.ie/en-us/tools
 Tech previews: devchannel.modern.ie

Why Spartan?

Windows 10 is a fresh new start for Microsoft, an opportunity to re-engineer its operating system and meet the needs of individuals and businesses, not just today but for many years to come.

In the course of its re-engineering review, Microsoft scrutinised its IE browser to determine if it should also be reimagined. An internal team was asked to study the underlying browser technology, website compatibility, web app interoperability, the needs of web developers and every aspect of a user's browser experience. After all, the modern web is where many of us spend a significant portion of our lives, browsing, watching, listening, communicating, researching and learning.

What came out of this review was Project Spartan, a web browser based on a brand new engine that delivers a fast, secure, reliable and power-efficient experience, and which is designed to be highly productive, yet remain instantly familiar and easy to use.

Edge's Features

Microsoft recently stated that its new Spartan browser, now renamed 'Edge', will be available across the Windows 10 device family – in other words, on all desktops, laptops, tablets, Windows Phones, and even it seems some IoT devices (such as the Raspberry Pi).

In terms of typical development cycles, it's still early days for Edge, but with Windows 10 expected to be released around the beginning of August 2015, things have to happen very quickly.

Let's look at what we know today. Bearing in mind things may change before the release date, certain features aren't fully operational and as yet undisclosed new functionality might suddenly appear.

Four key features stand out in Edge: the new web page rendering engine, Cortana integration, web page inking and enhanced web page reading. We'll cover the new rendering engine shortly, but first let's explore the other three features.

Cortana Integration

Microsoft has already made a big play about Cortana, emphasising the fact that in Windows 10 it's to become a versatile personal assistant with enhanced

Cortana

Up to now, Cortana has been used mainly for voice-activated commands on Windows Phone devices.

But Cortana is about to offer much more: a rich, flexible Bing-powered digital assistant. The original technology has now been updated with advanced speech recognition, natural language processing and machine learning capabilities from Microsoft's Research labs.

This means Cortana can now continually learn about its user's preferences and so understand their daily routines and habits. Consequently, the assistance on offer becomes increasingly personalised over time.

The perfect personal assistant is always available, anticipates our requests and works unobtrusively. Cortana hopes to become the perfect personal assistant by performing the right tasks at the right time and offering context-sensitive advice.

capabilities and intelligence (see boxout). Now it seems Cortana is going to be integrated into Edge.

At this point in time it's tricky to deduce exactly what sort of Cortana voice-assisted browsing experience we can expect later this year. How Edge interacts with other Cortana-enabled Windows 10 apps is equally unclear.

Even so, it's an intriguing aspect of Edge and one that's liable to grow in scope and functionality as Windows 10 matures over the next year or so. And it will be fun to experiment with Cortana to discover just what is and isn't possible.

Page Inking

Web page inking plays a big part in separating Edge from its IE 11 predecessor. With inking, you can type or write (using a finger, mouse or stylus) directly on the web page, to, say, create a comment about something of interest, add supplementary information or raise a question.

There's no doubt inking is an extremely powerful productivity feature and bound to be popular with teachers, students, writers and the like – especially when you consider an inked web page can be sent directly to OneNote for future reference or as easy-to-find research material.

Even better, all these comments, thoughts, notes and questions can be shared with friends and colleagues as a 'Web Note', sent

either via an email or by using one of the social networking options.

For many, Inking could become their favourite feature, especially if they already own a Microsoft Surface 3 hybrid tablet/laptop device or a touch-screen 2-in-1 laptop.

Reading Content

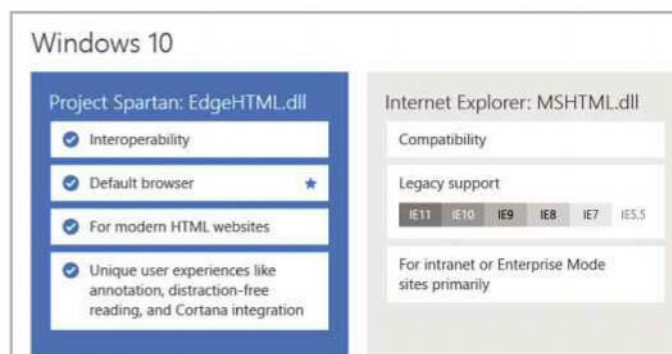
These days, we all spend a considerable amount of time reading web content, yet the typical web page doesn't offer a particularly comfortable reading experience. Microsoft wants to help, with Edge's new 'Reading List' and 'Reading View' features.

Working together, these features allow you to collate a set of web pages you wish to read. Any page in this set can then be saved for an offline, distraction-free reading experience, either in web page format or as a PDF file. And remember, any page could also include 'inked' comments, thoughts, notes and questions.

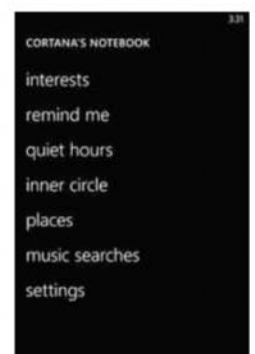
Inside Edge

At one point, it seemed Windows 10 would have a single browser, which supported both the new and old web page rendering engine. But that's not the way it's going to be. IE 11 will remain a Microsoft supported product even when Edge is fully available across all Windows 10 platforms.

Under the covers, IE 11 has the 'Trident' (MSHTML.dll) rendering engine. Although



▲ Edge compatibility



▲ Cortana notebook



▲ *Windows Insider Program launch*

regularly updated, Trident has been a feature throughout most of Internet Explorer's long history.

Edge, meanwhile, has the completely re-engineered 'Edge' rendering engine, delivered in the new EdgeHTML.dll file. This is a bold move, but so are Windows 10, Office Sway, HoloLens and many other Satya Nadella-led Microsoft initiatives.

A new engine means an opportunity to optimise the browsing experience; to increase web page loading and rendering speed; to enhance the web-based reading, watching, interacting and communicating experience; and to engineer a lightweight, battery-friendly browser that's more suited to smartphone and tablet platforms.

Of course, compatibility with the modern web and all its subtle intricacies is crucial to Edge's success. And, with built-in Flash support and much more besides, we can expect it to be superior to IE 11 in this respect.

The Future Is Edge

Microsoft has growing confidence that the Edge engine is the only one you'll need. Even at this early stage, testing indicates that relatively few websites seem to require the fallback support of the legacy Trident engine.

This boost of confidence means Microsoft is now fully committed to a future with Edge. In a recent blog post, Microsoft said, "Project Spartan is our future: it is the default browser for all Windows 10 customers and will provide unique user experiences, including the ability to annotate on web pages, a distraction-free reading experience, and integration of Cortana for finding and doing things online faster."

Microsoft was also keen to point out that, "Web developers can expect Project Spartan's new engine to be interoperable with the modern web and remain 'evergreen' with no document modes or compatibility views introduced going forward."

Developers were encouraged to try out Edge through early-access programmes.

Windows Insiders Program

Microsoft is keen to involve a wide and diverse community in its Windows 10 project. After all, Windows 10 is the future of Microsoft.

The mechanism to accomplish this goal is the Windows Insiders Program (insider.windows.com). Sign up online, and you'll have the ability to influence and shape this future.

You'll have early access to all the Windows 10 releases, across all the desktop, laptop, tablet, smartphone and IoT platforms. Releases that include the Cortana personal assistant, the new Edge browser and much more.

And you'll also have access to all the latest Windows 10 news, including details of future updates and improvements. As part of the large and still growing Windows 10 Insider community, you can post your own feedback, or read and comment on feedback from others.

If you're a software developer, you can download a preview of Windows 10 developer tools. Included in this toolset is an add-on for Visual Studio to help create Windows 10 universal apps. Or, if you're more of a maker, there are hardware development kit previews and documentation explaining how to create Windows 10 universal drivers.

In addition, Microsoft's status.modern.ie website has the current Edge state of play, with related pages containing developer tools, a website testing resource, technology previews, a roadmap and community interaction logs.

Right from the start of this developer collaboration, Microsoft noticed that the new Edge engine achieved substantial support from the web coding community.

IE 11 Support

As we said above, IE 11 will remain a Windows 10 pre-installed app for desktop and laptop environments, possibly some tablet devices too. At present, the Windows Phone platform looks likely to receive only the Edge browser.

This is a key point for Microsoft's enterprise customers. They need continued IE 11 support, at least for a year or two, so they can deploy their Active X controls, Browser Helper Objects and other legacy code. And this is exactly what they'll have with IE 11 in Windows 10, as well as Windows 8.1 and Windows 7.

This approach retains a clean separation between the new Edge-centric browser world and legacy IE 11 support.

However, unlike the new Edge browser, by default the IE 11 application won't be prominently displayed in the Windows 10 Start menu. Instead a user or system administrator will be able to expose this browser as a desktop pinned app.

Try Edge Now

On 30th March, Microsoft announced that Edge (Project Spartan at the time) was included in the Windows 10 Technical Preview build number 10049.

This means for the first time Edge is available to download, run and evaluate by

those who have signed up for the Windows Insiders Program (see boxouts).

As we've said, this isn't the final version. It doesn't have the polish or precision of a production-ready product, and it's likely to change considerably in terms of feature count and overall functionality. For example, the ability to read saved web content offline is not enabled in build 10049.

However, only weeks after it gave the same product build to its own employees, Microsoft has put Edge out in the wild to gather feedback. This is another remarkable sign of confidence from the reinvigorated, forward-thinking Microsoft organisation.

Community Product

In fact, one of the most striking aspects of this new Microsoft is that it's bending over backwards to involve the community in almost everything it does. Whether that be Windows 10, holographic technology, fitness bands or Microsoft Garage maker projects.

Edge has now been added to this list. The intention is to ship Edge builds quickly and use feedback from consumers and partners to improve the product before the next build cycle.

The more feedback Microsoft receives, the better it understands what customers really want. That can only mean the final browser product will have the most appropriate features, with a tuned user interface, so it can ultimately gain mass acceptance by the Windows community.

Sending feedback is easy. Simply click on the smiley face located on Edge's toolbar. Or alternatively submit your comments via the Windows Feedback tool, as found in the Windows 10 Start menu. Using the same Windows feedback tool, you can also view feedback from others and cast your votes. [mm](#)

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Is Advert Blocking Harming Your Favourite Websites?

Intrusive ads can be infuriating in the online age, but could avoiding them damage your favourite sites? Rob Leane did some digging

Any user of the internet will tell you that adverts can cause sizeable annoyances. In-your-face pop-ups, noisy trailers and splash-pages that keep you from the content you're looking for are among the most headache-inducing intricacies of the surfing the web. For those whose jobs involve flicking between articles or researching topics online, indiscrete promotions can be a hurdle in the way of getting the job done, and can cause rages in the best of us.

Is it such a surprise, then, that since web browsers gave tech-savvy types the opportunity to build their own software and alter the online experience (plug-ins, they're called), removing the ads

was one of the first ideas to find big success? Not particularly, and the popularity of such projects speaks volumes of the widespread irritation at unwelcome publicity campaigns. If so many people elect to ditch the adverts, something must be wrong with the experience, surely?

The People Profiting

The team behind Adblock Plus certainly agree with that statement. The free-to-download content-filtering extension has been knocking around since 2006, and Michael McDonald's original Adblock (which ABP forked off from), dates back even further. Under

Wladimir Palant's direction (McDonald transferred the company name to Palant in 2006), the Cologne-based company has gone from strength to strength. Initially, banishing adverts from Firefox was the main target, but the plug-in has expanded in availability to include Google Chrome, Internet Explorer, Apple's Safari and even Yandex in the last five years.

The success of the plug-in – which is funded by donations – has been phenomenal; “we have over 60m active users worldwide,” ABP's Operations and Communications Manager Ben Williams told *Micro Mart*. “The extension has been downloaded over 350m times. In the UK we have about 2m active users, which translates to about 3.5% of the online population there.”

In truth, this sizeable growth hasn't even come as a huge surprise. Said Williams:

“Why wouldn't you download a free app that can get rid of annoying ads anywhere on the Internet, thwart tracking and help you maintain your online privacy?”

Initially, it's hard to argue with the idea. Doesn't the internet user have the right to pick and choose what they see online, after all? “Yes, I think every user has that right, and I don't think it's a recent idea,” Williams replied. “Rather, sovereignty of screen goes back to the Internet's beginnings in the 90s. As control waned developers made solutions that got the Internet back closer to where it started. But back then they and other techies were the only ones who knew about these tools.”

“That's changed. As ad revenues declined, advertisers increased the number of ads as well as their annoyance level. This led more people to seek out tools like Adblock Plus to regain control... and/or sanity.”

The fact that internet frequenters have downloaded – and continue to use – Adblock Plus in their droves tells us that this attempt to regain control and sanity has been particularly well received. But everyone hasn't been able to agree on that.

Those Who Suffer

Advertising income has held up the journalistic world since time immemorial. You've probably never picked up a newspaper, magazine or even a theatre programme that hasn't included a few adverts to keep those involved paid for their work, and to cover the costs of printing and distribution. That hasn't changed in the modern age, with the rise of online ads benefitting the websites that need to pay their staff for content.

The only difference is, whereas with a newspaper an advert was normally just a handy spot to rest your cup of tea, online adverts can actually be removed with software like Adblock Plus. Ignore an advert in a paper? No problem, everyone still gets paid. Remove ads from a website? Not as cool, considering that ad revenue these days is based on how many times an advert actually gets seen, not the mere fact that it is online for however many days.

Gary Rayneau, the Deputy Managing Director of Advertising at our home company, Dennis Publishing, described advertising income as “imperative” to running Dennis websites. “Advertising is the sole revenue stream for the vast majority of Dennis sites,” Rayneau added.

“We have a duty to our readers to produce quality and free to access content, we also have a duty to fund this content through advertising that is appropriate for the particular site,” he elaborated. “In turn, we also have a duty to our advertisers to offer effective solutions – and rightly so given they fund the site and pay our wages.”

It's beginning to look like a Catch-22 situation, then: publishers and websites need adverts to survive, and a decent chunk of us web users don't want to see them. How much of an effect would it have

if a regular visitor to a Dennis site (let's say, someone who visits our stable-mates at *Den Of Geek* five times a day) blocked all adverts using a service like Adblock Plus?

Rayneau's approximation was that “on a micro level, if one person installed an ad-blocker, across their lifetime of activity on our sites you could definitely estimate that would be enough revenue to pay for a freelance feature [meaning a freelance article, like this one]. On a more macro scale, if 25% of our readers installed an ad-blocker the site would very quickly become untenable without cutbacks.”

“If too many readers blocked ads,” Rayneau summarised, “there would be a number of affects; the quality of the journalism, photography and production would vastly drop, the site may become subscription/fee based, users who didn't block ads would potentially be served more ads to take the strain of the costs, and the likelihood is the site would cease to exist.”

“Ad revenue these days is based on how many times an ad actually gets seen, not the mere fact that it is online”

That's scary information to hear if you're someone who visits a lot of websites (or indeed, someone who gets paid by websites). As Adblock Plus and other similar services continue to grow, it sounds like our favourite websites could suffer, unless a happy medium is found.

Further Afield

At *Empire Online*, the website version of the popular film magazine (which is housed at Bauer Media), the same strains are felt. *Empire Online* is “predominantly ad-funded,” said *Empire's* Online Editor James Dyer, so advertising revenue is “very important” to the upkeep of the site.

“Ad blockers let you cheat the system and essentially both have your digital cake and eat it,” Dyer added. “It's not hard to see the appeal, but if everyone did it then a lot of sites would probably disappear, and the end user would suffer in the long run.”

“Ultimately ads are extremely annoying, often intrusive and slow down page loading,” Dyer admitted. “When ads are unobtrusive, and have no negative impact on performance while in no way obfuscating the consumption of editorial, then they're fine, but this is rarely the case.”

“If I had my way we'd have NO obtrusive, content blocking ads and no unstoppable pre-rolls either,” he added. “Anything that interferes with the consumption of content is a negative, frustrating experience for readers and can only reflect poorly on the reader's perception of the advertiser in question.”

Suggesting the potential source of the problem, Dyer added that “sadly, advertisers don't see it that way and would rather pay big money for ‘high impact’ (read: extremely intrusive) creative ads that frustrate users. I understand that subtle display formats are largely tuned-out by users, but the negative impact of frustrating them is surely even more problematic.”

All across the board, then, it sounds like the growth of ad-blocking is a cause for concern among websites, publishers and editors. Should usage of Adblock Plus grow significantly further than that ‘3.5% of the UK’ statistic, it feels, based on these interview quotes, that the consequences could come thick and fast. Did Mr Dyer tap into something with his comment about unobtrusive ads, though?



A Potential Solution?

It's something that the team behind Adblock Plus has been working on. When asked about the concerns that their service could be damaging to websites and small businesses, ABP's Ben Williams explained that "they're the reason we started our Acceptable Ads initiative."

This initiative allows websites to ask for their non-obtrusive advertising content to be white-listed and shown to users of Adblock Plus who have opted to support the scheme, as long as said advertising content meets some prerequisite conditions.

These stipulations (which are, admittedly, a work in progress) include: 'static advertisements only,' 'preferably text only, no attention grabbing images,' 'ads should never obscure page content (e.g. require users to click a button to close the ad before viewing the page)' and 'advertising should be clearly marked as such with the word "advertising" or its equivalent,' among other requests.

"Increased ad-blocking was threatening websites, and we set out to find a way we could help curtail this threat," Williams explained. "The result is our initiative, which lets website owners apply to have some or all of their ads whitelisted if they meet the aforementioned criteria. So far the initiative has produced lots of happy websites with acceptable ads and users who can turn off the feature if they dislike it."

This is certainly a start, and marks a significant and impressive compromise on the part of Adblock Plus. Additionally, some particularly sharp webmasters of the world have found ways to detect the use of Adblock Plus and put up a message in place of the ads explaining how integral their advertising income is and asking users to reconsider blocking them.

Arguably, neither option is perfect, and as *Empire's* James Dyer pointed out, advertisers are willing to pay more for the obtrusive

options, for fear of being phased-out by website visitors. Adblock Plus users can also choose to opt out of the Acceptable Ads initiative anyway. Resultantly, websites are still missing out on some income, which (as Dennis Publishing's Gary Rayneau pointed out) could cause real problems over a user's lifetime usage of a site.

It's worth considering that websites that may attract advertisers of films, television programmes, tech products or books probably rely almost entirely on image-based adverts, which would make them

“ The online world is a discursive realm, where users can react to parts they don't like by blocking them ”

partially illegible for Adblock Plus' Acceptable Ads initiative. This initiative may not be the perfect solution, then, but it's impossible to argue that it's not a step in the right direction.

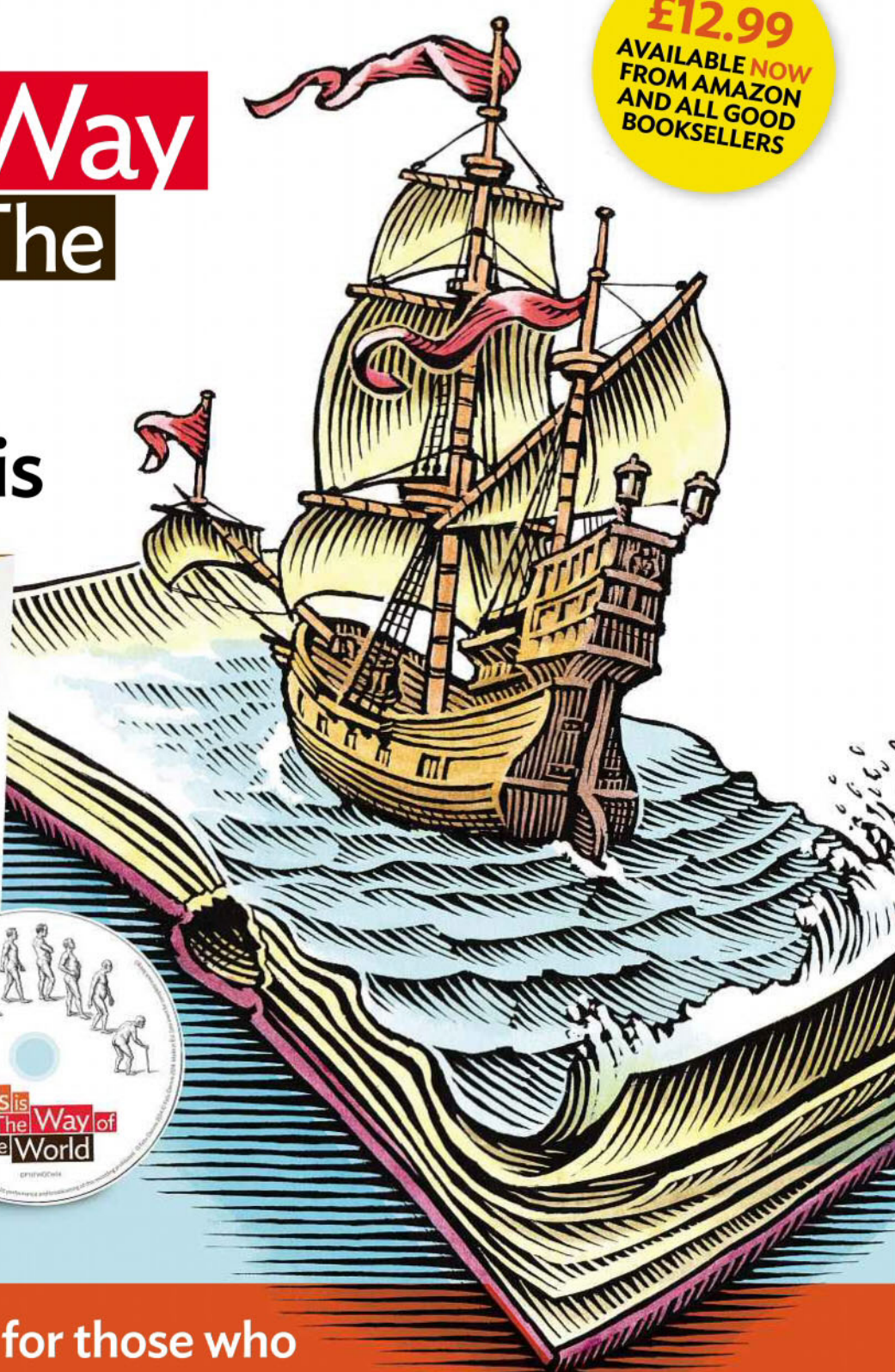
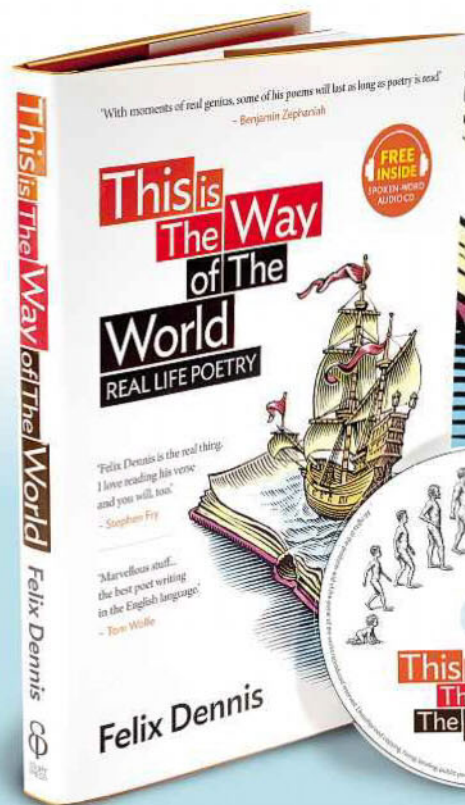
More so than newspapers or magazines, the online world is a discursive realm, where users can react to parts they don't like by blocking them outright, regardless of the consequences the offending website may eventually face. The result is a conversational state between websites, advertisers and users. It's a far more democratic system than printed media, but hopefully a happy compromise will eventually be found. After all, it benefits everyone (advertisers included) if the internet works in as smoothly and user-friendly a manner as possible. [mm](#)

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Remembering... Modems

David Hayward explores the world of dial-up this week

The ability to communicate with other computers over telephone lines has been around for an age, but it wasn't really until the early 80s that it became more mainstream, in that people who weren't university computer scientists had some knowledge of it.

After the film *Wargames* and with the advent of the 8-bit home computer, a modem was a luxury item that only the really serious computer user had in their collection. However, by the early to mid-90s, the humble modem had become as much an essential item in the personal computer's arsenal as a keyboard, mouse and printer.

From 33.6K up to 56K modems, in the mid to late 90s, the sounds of the strangled budgie could be heard emanating from PC speakers across the world. Those with enough cash used ISDN, and if you were lucky enough to work in such an environment, you had access to a leased line. But it was the lower bandwidth modems that paved the way for the internet we know and love today.

Remember how we marvelled at those impressive web pages, how we could download early MP3s, and how the chat boards were alight with inane talk of who had the best cabling to get better signal quality? Imagine, then, taking someone who is used to broadband speeds nearing that of a LAN and placing them in front of a 33K modem. Would they have the patience to wait it out until the page had loaded? Like watching the ZX Spectrum version of *The Hobbit* loading its images in-game, the modem may have been slow compared to these days, but back then it was the window to another world.

Its History

Although the ability to send data over telephone lines has been around since the 1920s, a loose definition of a modem with news wire services, it wasn't really until the late 40s and early 50s that the term 'modulator demodulator' was beginning to be used.

We can credit the US Air Force, apparently, for the invention of the true, modern meaning of a modem. It seems that the USAF SAGE Air Defence system needed a way in which to transmit radar images to various command centres around the world, and since the telephone backbone was already in place, the solution was to improve the technology either end of the line.

The first true modem was AT&T's 101 model, a unit the size of a washing machine. That was quickly followed by the 103 model in 1962, which allowed full-duplex transmission and data speeds of up to 300bps.

As the technology improved, the Bell 212 was made available to companies outside of the forces and had incredible speeds of 1200bps. Eventually, as noise and echo cancellation technologies were introduced on phone lines and better error correction and filtering was implemented on the modems, the speeds grew in the 80s and 90s to 14.4K, 28.8K, 33.6K and finally 56K.

After that, the internet and technology surrounding communications had grown to such an extent that the poor modem had reached its limit.

The Good

A modem gave us access to BBSs, college, and university servers and network games of *Doom* with users across the country. It opened the eyes of the PC users and brought the world to our fingertips.

The Bad

By opening up the PC, it did bring in the potential for better virus outbreaks. And let's not forget the more nefarious and unmentionable areas of the internet.

Did You Know?

- There are still over 40 million active modems, traditional dial-up, connection in the USA.
- Many universities still have a modem, dial-up backup to access their systems in case of a line outage.
- The modern Google front page can take over 15 seconds to load on a 56K modem.
- The biggest hack of all time, by Gary McKinnon hacking the US military computers looking for evidence of UFOs, was conducted with his trusty 56K modem.



▲ The early modem at work



▲ Anyone else remember the US Robotics Sportster range of modems?

Component Watch

James Hunt picks out some posh monitors this week

The price of high-end 3D and 4K monitors is plummeting every day, so how much further do they need to drop until you're ready to buy one? In case you're thinking of upgrading, we've taken a look at some of the most competitive premium screens on the market so you can see whether the time is right for an upgrade.

Deal 1: AOC D2769VH
RRP: £224.99 / Deal Price: £199.16

This passive-3D screen is cheaper than active-shutter monitors, but it's also 27", which represents a considerable increase over 24" varieties. Both of these features make it ideal for those who want a screen they can use as a TV and share with others in the room, and dual HDMI inputs make it perfect for use as a console screen. Great value.

Where to get it: CCL - <http://bit.ly/1EKhpOL>



Deal 2: BenQ XL2411Z
RRP: £259.99 / Deal Price: £209.98

The 24" XL2411Z has several BenQ-unique features, including built-in Motion Blur Reduction technology and Low Blue Light LEDs, which prevent eye strain, save energy and reduce sleep-cycle disruption. Its 3D-capabilities allow it to run in 100Hz, 120Hz or 144Hz mode, and the Display Pilot software allows you to quickly set and save viewing profiles depending on your preferences. It's a little less impressive than its more expensive line mate the XL2420Z, but it's also far better value!

Where to get it: CCL - bit.ly/1yWD3fj



Deal 3: Asus VG248QE
RRP: £299.99 / Deal Price: £239.09

This 24" active panel 3D monitor is expensive, but it's also super-sharp, bright and high-resolution, with a huge number of inputs and a selection of presets to help you configure the

best visuals regardless of the situation. Whether for 3D movies, 3D gaming or just normal 2D work, this is a monitor that competes with the best of them.

Where to get it: Scan - bit.ly/1L2Q0w1



Deal 4: Samsung U28D590
RRP: £439.99 / Deal Price: £393.12

The 28" Samsung U28D590 is one of the cheapest native 4K monitors you can buy, but a 1ms response time and dual HDMI input with DisplayPort make it superb for games and movies. There's even a special Game Mode, which optimises colour, brightness and contrast for gaming. Combine that with Samsung's MagicAngle viewing-angle enhancements, PIP/PBP and Ultra HD upscaling, and this is a monitor that'll justify every penny of its price.

Where to get it: Dabs - bit.ly/1EG0zzS



Deal 5: Asus PB287Q
RRP: £449 / Deal Price: £419.98

The 28" Asus PB287Q is a similarly excellent 4K monitor, if slightly less feature-packed. It does have a flicker-free backlight and strong anti-ghosting technology, making it ideal for gamers, while built-in 3W speakers and HDMI, DVI, DisplayPort and VGA sockets ensure you get everything you need to get a 4K system up and running immediately. It's incredibly affordable for its size and class, and that makes it an ideal entry-level 4K monitor for the slightly more demanding buyer.

Where to get it: Dabs - bit.ly/1PHwWEw





Oculus Rift Here Early Next Year

Microsoft Breaks Windows

Dumps numbers for future OS refreshes

Windows 10 is to be the 'last' version of Windows, according to a development exec at Microsoft.

Comments made by Jerry Nixon at the company's Ignite conference confirmed that Windows 10 is the last major change in how the OS operates, with any future developments being via regular incremental improvements rather than major overhauls.

Microsoft has since reiterated Nixon's words via a statement picked up by the media:

"Windows will be delivered as a service bringing new innovations and updates in an ongoing manner." So there will be no Windows 11 and the move from Windows 8 to 10 has been confirmed as a deliberate shift to further signify this change in approach.

With Windows 10 the last of its kind, Microsoft had better make it a good one when it lands this summer.

Pizza Hut App Saves Woman

Hostage situation resolved with quick thinking

A woman in Florida, USA was saved thanks to a slice of clever thinking and a smartphone app provided by Pizza Hut.

According to media reports, Cheryl Treadway was involved in an argument with her boyfriend, who apparently had with him a large knife. As she tried to leave her home in order to pick up her kids from school, said boyfriend grabbed her and took her phone, going with her to the school. Eventually, Treadway

managed to convince her boyfriend to let her use the phone to order a pizza, when she sent a message to Pizza Hut using the app that read "Please help. Get 911 to me". Employees recognised the address and name, realised the comments could be very real, and called the police who duly sent officers round.

Happily, the situation was resolved with no one getting hurt. We've no idea what happened to the pizza order, but full marks for Treadwell's quick thinking.



Consumer editions announced

The future of virtual reality is here. Virtually. Yes, Oculus VR has announced that its already iconic Rift headset will be on sale for consumers within the first quarter of next year, meaning that consumer units will be happily sitting alongside the existing developer editions pretty soon.

Actually, Oculus VR won't be first to market as HTC's own Vive headset should be released

at the back end of this year. The Oculus Rift is worth getting excited for, however, as it's going to work with PCs to provide 3D stereoscopic imagery right in front of your eyes with a 360° tracking of head movement.

Exciting stuff, but with Sony and HTC on its heels, time will tell whether Oculus' entry will prove more or less successful than the others. Pre-orders should be opening later this year.



This week, having read our lead feature, I've spent quite a bit of time changing passwords – but not just for email accounts. No, I've changed pretty much every password I have, from PayPal to Amazon and more.

I've also spent a good deal of time resetting these passwords, having completely forgotten (within the space of about five minutes) what I changed them to.

Whether it's due to my advancing years or the after-effects of watching too many cat videos on YouTube, I don't know, but I can't seem to remember these things like I used to.

Thankfully, we live in a world that offers us password managers, so I downloaded and installed LastPass, a service that remembers these details for you. So far, it's been pretty good, and it's comforting to know I now have much more secure passwords.

One problem, though: I keep forgetting my LastPass master password.

Oh well, it's a start, at least...

Anthony

Editor

Gaming Cheat Killed!

Virtual character made to take giant leap to his death

A hacker who had been causing all sorts of problems on online game *Guild Wars 2* has had his character killed as punishment.

The character was called DarkSide and it was stripped of all its clothes and forced to jump to its end from a parapet in a unique death sentence that was called for by gamers in the virtual world.

The hacker's nefarious activities, which involved him dominating all-and-sundry using a bunch of exploits that allowed him to teleport, sustain huge damage and beat down anyone who dared to stand up to him, were increasingly becoming a problem.

As complaints piled up, players took the collective decision to do something about it, and so evidence of his ill-

gotten gains was put together, published on YouTube, and justice was meted out. The game's security staff found him, took control of his character and killed him off in a very public display of retribution. The hacker himself has also been banned from playing, naturally.

Woe betide anyone who messes with that lot in the future, then.



Meanwhile... On The Internet...

The cult of the late night talk show may be a distinctly American tradition – though one the UK has long tried to emulate, with limited success, either by importing it or imitating it – but, in the internet age, the activities of Seth Meyers (tinyurl.com/MotI1363a), Conan O'Brien (tinyurl.com/MotI1363i) Jimmy Kimmell, Craig Ferguson (and replacement James Corden: tinyurl.com/MotI1363b) and the current champ, Jimmy Fallon (tinyurl.com/MotI1363c), have become more widely viewed (geographically speaking) than ever before. In fact, the truncated clips preferred by viral viewers could potentially be the best thing that's happened to the staid format in quite some time, as it allows viewers to feast on the best bits without having to be wed to the couch of an evening. And it allows the personalities, who use the shows to flog their latest wares, to speak to a global audience. Indeed, Fallon has parlayed his comedic charm, musical ability and keen eye for a clickbait into a ratings winner (tinyurl.com/MotI1363d), effectively taking over from the former king of the format, David Letterman. The search for the next viral YouTube hit is not something Dave's going to have to worry about any more, though, as his 35-year run as a fixture in American homes is will be over by the time you read this.

His departure is one more indication that the times are always a-changin'. Though his show's anarchic format refreshed the paradigm back in the early 80s (here's his first *Late Night*, with Bill Murray: tinyurl.com/MotI1363e), and his defection to CBS in 1992 made a mockery of NBC's decision to hand Johnny Carson's well-worn chair to Jay Leno, the fact that *The Late Show* has largely failed to compete in the new-media arena against his far more savvy competitors (tinyurl.com/MotI1363f), and that it looks long in the tooth, probably prove evolution is no bad thing.

What can never be argued is the affection with which he will be remembered, nor the sheer number of brilliant moments he has been responsible for (especially musical ones: tinyurl.com/MotI1363g). The irony is that his legacy will live on in the hundreds of home-recorded YouTube videos that will allow those moments to be replayed long after the now 67-year old has moved on into retirement.

While we're by no means an expert, we can recall his attempts to champion Bill Hicks in the early 90s (and the battles Hicks fought with his show's censors at NBC), and his wonderful patronage of Warren Zevon right up until the singer's death at just 56 (tinyurl.com/MotI1363h). His place as the longest-serving talk show host in the US will stand for a good time yet, and rightly so.

If you have a long memory or become obsessed with things like we do, you may remember the activities of Prenda Law, the US copyright enforcement company that turned out to be using underhand tactics in order to get money out of people (tinyurl.com/MotI1363p). If you do, you'll be depressed to hear that the ripples from that are still radiating through the US courts to this day, with the people behind the company still hiding in a legal black hole. We'll leave the last word to Morgan Pietz, representing a man who fell foul of Prenda's business model: "What happened here is the reason why many people hate lawyers." Amen to that (tinyurl.com/MotI1363q).

Last week we reported how Reddit was looking to create its own original content, and how many observers of the online media industry were framing this as an attempt to kerb the 'wild west' reputation of the site, make it more attractive to potential advertisers and offer its investors returns on some of the money it garnered last year. Well, another sign that Reddit is looking to smooth off some of its slightly unpalatable edges is the news that it says it's looking to clamp down on cyber-bullying across its sprawling territory (tinyurl.com/MotI1363j).

In a low-key recent blog post (tinyurl.com/MotI1363k), those behind the site set out to define what they saw as harrassment and illuminate why they feel the perception of Reddit (as reflected to them by a recent 15,000-participant survey) was becoming a barrier to people using the site. The take-away quote from the whole thing was undoubtedly that "instead of promoting free expression of ideas, we are seeing our open policies stifling free expression; people avoid participating for fear of their personal and family safety", which is as close as Reddit has ever got to admitting its problem with bullying and that a laissez-faire attitude is not sympatico with its growth as a platform in the future.

However, with a staff of just 76, it's far from clear exactly how Reddit will begin to deal with reports from over nine million users across thousands of subreddits (tinyurl.com/MotI1363l), nor whether increased policing will affect its attraction among its current core audience. It'll be interesting to see how this all plays out, no doubt.

.AVWhy? Videos For Your Eyes... Not Necessarily For Your Brain

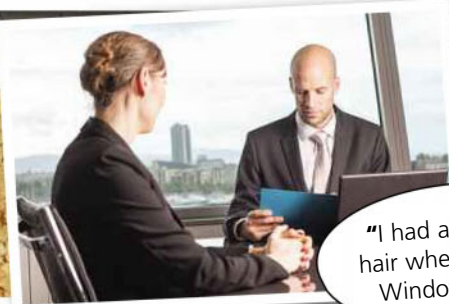
If you saw the Star Wars trilogy in cinemas when it was originally released, you may remember that the last two movies were shown alongside short films, which came before the main feature. *Return of the Jedi* was prefaced by the haunting CGI animation *Dilemma* (images from which members of Team Meanwhile have carried in their minds for over 30 years: tinyurl.com/MotI1363n), and *Empire Strikes Back* featured a live-action movie called *Black Angel*. Long thought to be lost, the movie was directed by Roger Christian, who had previously worked on *Star Wars*, *Alien* and *The Life Of Brian*, and would later direct the infamous *Battlefield Earth*. It's a cracking little sword-and-sourcery number, so it's great to hear that a print has now been found, and even better to know you can now see it via YouTube (tinyurl.com/MotI1363o)

Aaaaaaaand Finally...

You've probably never heard of them, but hipsters have been a staple of internet memes for a good while now. We, of course, preferred the earlier hipster memes, the ones before they sold out and got popular. The latest of this long-running source of internet funny is #HipsterCop, an office of the Met, snapped at a recent EDL protest: tinyurl.com/MotI1363m.



Caption Competition



"I had a full head of hair when I clicked on Windows Update"

Plenty of funny this week, so let's get straight to it, eh..?

- **Planeman:** "A still from the new Hitman film *Agent 47: Accountant*"
- **wyliecoyoteUK:** "So far, Marion had resisted the urge to polish by holding her hands tightly together."
- **Dwynnehugh:** "DWP Officials pondering Ed Balls' unemployment benefits."
- **Jayceedee:** "The solution for the 'Paperless Office' – store your old folders in a stripped out Laptop shell."
- **Dwynnehugh:** "The Front Bench of the Lib-Dems in a private session."
- **Phantom9:** "So... you are saying that this folder should be grey, too?"
- **Jayceedee:** "Jason's stand-in wasn't impressed with the scripts for *Transporter 5* and his wife thought the stunts were too wild."
- **Thomas Turnbull:** "You do seem a bit over qualified for the window cleaning job."
- **John Cawley:** "Okay so you're good at Photoshop, but putting my head in an egg-cup isn't that funny."
- **Bullstuff:** "Asking to stroke my head may be construed as harassment."
- **John O'Connor:** "And don't you think it's rather irrational to hate 'TILES' that much? "
- **David Hill:** "Not much call for the iComb around here."

The winner, however, was Blacklion1725 with "I had a full head of hair when I clicked on Windows Update." Well done!

To enter this week, head to the 'Other Stuff' section of our forum (forum.micromart.co.uk) and say something funny (but not too rude) about the picture below or email us via caption@micromart.co.uk.



Photobucket Offenders Arrested

American justice served on pair

To America again, and news now of a couple of blokes who were arrested for breaching the terms of Photobucket.com.

The chaps now face charges of conspiracy and computer fraud for providing an application called... well, we won't say actually, but imagine a foul-mouthed version of 'Photobucket' and you be

in the ballpark. Anyway, the chaps behind it provided the app to other nasty pieces of work who were trying to hack the site in order to get their grubby hands on users' private data, images and videos.

In terms of the scale of the damage caused, the men are reportedly facing a fine of up to \$250,000 and possible prison term of up to ten years. Ouch.

Nintendo Makes A Profit!

Four-year wait comes to an end

Nintendo has made its first annual operating profit for four years, beating market forecasts in doing so. It was apparently around £136m in the black for the year to March, with lower costs cited as helping counter slowing revenue growth. The firm is looking forward to the future too with annual operating profit now predicted to double over the next year.

Away from the financials, other news to surface from Nintendo is in the smartphone arena, with the firm's President confirming that the first of five mobile games will be out before the year ends – with a further four due by March 2017. A move into the smartphone market could help the company to further its revenue stream, of course.

Snippets!

Del Boy Fall Goes Viral

So you've seen the single most popular clip from *Only Fools And Horses*, right? The clip in which Del Boy tells Trigger to play it nice and cool, right before leaning over a bar and royally falling over to much laughter among the audience. Well that moment has been recreated, apparently completely by accident, and captured on CCTV at a pub in Accrington. In the clip, which has gone viral thanks to YouTube, a pub-goer leans back on a pool table that has been moved unbeknownst to him, and promptly falls right on his posterior. If it is, as it seems to be, a genuine accident, it's utterly hilarious.

WinOptimizer 12 Here

Ashampoo tells us that it's WinOptimizer 12 software will be available by the time you read this. Alongside graphical improvements it'll apparently also offer significant search and navigation tweaks making it more efficient. In terms of features, it will have a drive cleaner, Internet cleaner with multi-user support, file encryption and splitting, disk benchmarking and SSD optimisation.

That all sounds pretty great, but you can find more details at www.ashampoo.com/uk/gbp, including a price – which we don't currently have. Expect it to be pretty close the £30 you'll pay for v.11, though.

Email 'Epidemic' Harm

A former government advisor has warned that employers have to deal with what he calls an "epidemic" of employees checking work emails outside of working hours.

Sir Cary Cooper was quoted by the BBC as warning that "For people to be working at night, weekends and holiday on emails is not good for the health of our country." Calling for fewer internal emails, he also wants more face-to-face meetings and phone calls.

£6 Computer Lands On Kickstarter Seriously

Pitched as being "Built for work, play, and everything in between!" the C.H.I.P computer has made it to Kickstarter.

Potentially, this is serious competition for Raspberry Pi as it will cost just \$9, which is less than £6 in our money, and it runs a 1GHz processor and holds 512MB of DDR3 RAM – so it should be more than powerful enough to cope with the tasks that its creators claim it can. Those demands include working in LibreOffice, playing games via connected Bluetooth controllers, surfing the web via built-in wi-fi and the Chromium browser, coding with the

pre-loaded Scratch programme, plus a bunch of pre-installed applications, tools and games.

PocketC.H.I.P. makes the board portable by pairing it with a 4.3" touchscreen, QWERTY keyboard and a 5-hour battery in a case small enough to fit in your back pocket. PocketC.H.I.P costs \$49 and it's a nice addition to appeal to a broader audience.

This is very much a reality as its \$50,000 funding goal has been well and truly smashed (well over \$900,000 the last time we looked). £6 for a computer? Worth a shot, right?

Bank Robber Posts Heist Online Boasts before arrested

A bank robber in Virginia, America, posted videos of his latest heist, plus a photo of a note he left asking for \$150,000, just before he was arrested.

American media reports noted that Dominyk Antonio Alfonseca handed a note to a bank teller asking for money and he then left the bank and pretty much straight afterwards posted a couple of videos on Instagram, plus the photo.

Unsurprisingly, Alfonseca was arrested 22 minutes later and then charged with robbery. The evidence was certainly there, right?

Alfonseca has since told US media site Wavy.com that he didn't really view the incident as a robbery, as such. His argument going that he wouldn't have posted the videos online were that the case.

Good luck with that one, Dominyk.

HyperX Predator Breaks New Ground

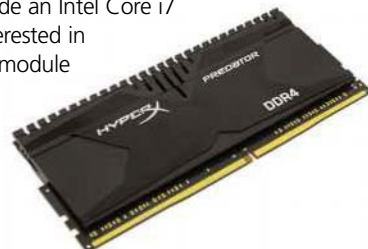
World's fastest memory kit from Kingston

Kingston's HyperX division is celebrating, as the hard-working people there have created the world's fastest DDR4 128GB memory kit. If speed is your thing, this should float your boat: it runs at an "astounding" 3,000MHz!

The kit itself consists of no less than eight 16GB HyperX Predator modules with timings of 16-16-16-36, described by the firm itself as "ultra-tight", plus XMP profiles for easy, stable overclocking, while the

record was achieved using the MSI X99 MPOWER motherboard in an eight module, quad-channel configuration alongside an Intel Core i7 5820K processor. Interested in picking up a HyperX module for yourself? Enter

www.kingston.com into your browser of choice to find out all you need to know.



Woman Fired For Uninstalling Tracker App

Firm monitored her 24/7

Why is it that America is often the land of the slightly odd story? In this particular instance, we go to California where a woman has filed against her company over claims that she was fired for uninstalling an iPhone app that she was required to run in order that her employers could track her movements.

Ars Technica reported that the sales executive claims in her lawsuit that after uninstalling the Xora app, which records mobile workers'

information when they're out in the field, she was let go soon after. Naturally, the woman's problem with the app was that she didn't want to be monitored outside of working hours, something her boss reportedly insisted on.

So, invasion of privacy is at the heart of this and the woman is looking for damages for what she believes are unfair working conditions.

Imagine if your boss asked for you to sign up to being monitored 24/7? Like Big Brother, but without the wacky fame wannabes.

Self-Driving Vehicles Have Accidents!

World still spins

Apparently, of the 48 self-driving cars that are currently driving around the roads of California proving they are a viable concept, four have crashed.

Considering that those crashes were over an eight-month period, we don't necessarily think that it points to any worrying trend concerning self-driving vehicles. Vehicles are involved in crashes. Every day, we're told. Some – whisper it – with drivers behind the wheel.

The data on this comes from California's Department of Motor Vehicles but, as Google (and its parts supplier, the GM-owned/UK-based Delphi) denying that their cars were at fault, it's simply a case of a car accident happened somewhere and life carrying on.

The fact is that we shouldn't worry any more about the future of driverless cars now more than we did previously. Keep calm and move along, people. There's not much to see here.

Turn Walls Into Interactive Touchscreens

Indiegogo project becomes a reality

Further proof that crowdfunding really does work is here in the shapely form of the Touchjet Pond projector, a device that turns any wall, ceiling or floor into an interactive touchscreen.

Providing a display of up to 80", this consumer device can be taken with you as it fits into your back pocket and is built on

the Android 4.4 OS, so there's access to thousands of Google Play apps. Projecting from a smartphone or tablet using a third-party app, the Touchjet Pond will launch on Indiegogo next month, following a highly successful funding effort on the site, for the not inexpensive sum of £600. It will also be available to a wider audience via www.touchjet.eu later in the year.



Philips Blade 2 Monitor

Philips tries to ride the smartphone bandwagon and falls off

DETAILS

- Price: £199
- Manufacturer: Philips
- Website: www.philips.co.uk
- Required spec: Computer or console with VGA or HDMI output

Because this monitor has the same structural layout as an AOC I reviewed here recently, there appears to be something attractive about it for the display makers. What I'm referring to is the large support foot in which the inputs and speakers have been placed, allowing the screen (23 inches in this case) to be thin and elegant.

But my complaints about the AOC I2473PWY, specifically that you can't wall mount it and the need for an external PSU, are equally applicable here.

I also wonder about the purpose of making the screen so thin, because the depth of the base and the additional space needed for cabling precludes it getting flush with the wall.

But let's talk about what's good here, because there are a number of plus points to the Blade 2. First of these has to be the drop-dead-gorgeous IPS panel Philips put in it. Its crisp, has strong contrast ratio, an excellent colour gamut and exceptional viewing angles. At just 250 cd/m², this isn't the brightest panel I've seen, and ideally it could have benefited from extra illumination, but otherwise it's great.

The flipside of IPS technology is a response time that isn't as fast as



TN technology, introducing lag that some gamers find unacceptable. Personally, I'm not good enough at fast-paced games for it to matter, but others might find it impairs their frag count.

That is a minor problem, because where I really lost patience with the Blade 2 was when I started to test its party trick, Miracast. This was a parallel of my AOC experience, because this implementation is equally fraught with problems.

PCs won't connect for any obvious reason, and when they do it changes their screen resolution, even though they're the same natural res as the screen. It also takes nearly a minute to become ready for use. When it finally is ready and you've connected, taking at least another minute or more, playback is choppy and massively delayed.

Buying the Blade 2 for Miracast, you'll be disappointed if it doesn't undergo some massive transformational update soon.

As if to add insult to injury, in the review model, all the Miracast messages were in German, even though I'd set the menus to English.

This design also includes HDMI MHL support, so if you want to connect your phone or tablet to it, I'd use that, as it works well and can be ready to use in mere seconds.

Even with MHL, the inputs are a somewhat disappointing selection, with just VGA and HDMI. Philips also didn't include an HDMI cable, saving a few pennies, and the lack of any USB hub is also a regrettable omission.

Overall, the Blade 2 combines both the best and the worst of what Phillips has

to offer. The screen technology is exceptional, but the critical details, like Miracast and the limited inputs overshadow those positive first impressions comprehensively.

The final nail is the price. If you want a Philips 23" IPS monitor and casting capability, I'd buy the 234E5QDAB/00 (DVI and HDMI) for about £145 and get a Chromecast for £30, and pocket £25.

mm Mark Pickavance

Another underwhelming Miracast capable monitor



Pan & Tilt HD Camera

Michael Fereday puts his living room under close surveillance and records the evidence

DETAILS

- Price: £144.00 (Amazon.co.uk)
- Manufacturer: Swann
- Website: www.swann.com
- Required spec: n/a

The Internet of Things has opened up new avenues of information gathering. We can now be kept informed as to what might be occurring in our homes when we're away for whatever reason. It's relatively straightforward to set up a system that can respond to different types of activity and sent alerts to designated personnel. One such product is the Pan & Tilt HD Camera from Swann.

Supplied with a choice of wall or ceiling mounting brackets if you decide against positioning the unit on a desk, this camera has both pan and tilt capabilities (hence its title) which can be controlled and adjusted remotely. The camera is attached to a base unit that contains connections for Ethernet use and mains power, plus a slot for inserting a micro-SD card to store images, and a mini-HDMI port for linking the camera to a HD television for large screen viewing. You'll need to supply both the HDMI lead and micro-SD card. There's also a screw mount fitting for attaching a supplied antenna if you plan to use the unit's wi-fi capability.

Whether you opt for a wired or wireless connection, the Pan & Tilt camera will need to be integrated into a home network. Support is provided for WPS linking.

You need to hold down a button on the base unit while activating the appropriate mode on your router to establish a connection.

You'll need to download the SwannCloud Mobile app from the App or Play Store in order to control the camera remotely. The app will need to establish a link to the camera unit. This process involves the app creating a QR code, which the camera needs to scan to set up the connection. It took me a couple of attempts before the process could be completed successfully.

The SwannCloud Mobile app divides its functionality into the four distinct areas of Home, Events, Camera and Others. I should explain that Swann defines an event as a detected incident. The initial Home screen view shows the number of cameras that have been set up, along with the

number of events with links to the last two showing the date, time and type of incident.

For more information about events, which are classified under headings that include intrusion, tampering, facial recognition and offline status, you need to switch to the Events tab. You can view a scrollable list of incidences that have been detected and recorded in ten-second video files. These events are sent to your mobile device using Push technology, allowing you to view the scene and decide what action to take. With a micro-SD card inserted, these events could be viewed on a computer later.

While motion detection is tuned on by default, other features, such as intrusion or camera tampering, will need to be turned on manually via the Settings option accessed from the Camera tab. This tab also allows you to view a live



stream from the camera on your mobile device. You can make adjustments remotely to the camera's viewing position via its pan and tilt features.

I did encounter one slight problem with this camera. Shortly after setting up the device, I was advised that a firmware update was available, which would take around ten minutes to complete. However, it required several attempts over a number of days before the update could be downloaded and installed. Other than this, my experiences with this device were trouble-free.

mm Michael Fereday

A useful tool for keeping a check on part of your home



i-Rocks Golem Series K50E Keyboard

A scissor action keyboard that's a cut above the rest

DETAILS

- Price: £25
- Manufacturer: i-Rocks
- Website: goo.gl/wNH20
- Required spec: USB or PS/2 port, OS independent

i-Rocks has previously impressed us with its low-priced but high-quality K10 USB Gaming Keyboard. Now, however, we're upping the game slightly with a higher-end model from i-Rocks, but will it impress us as much as the K10 did?

The first thing you'll notice is the difference in weight. While the K10 was in excess of 1.2kg, the K50E is considerably lighter by about half as much. That doesn't mean it's lacking in sturdiness. i-Rocks engineering department needs to be congratulated on the design and structure of the K50E, because it's as solid a keyboard as you'll find anywhere.

It's a USB keyboard, but comes with a USB-to-PS/2 dongle, with 24-key anti-ghosting, fully LED backlit, three multimedia volume keys, a Windows Key lock and a decent cable length of 180cm. In terms of how it looks, it's very similar to the K10, except for the extra keys along the top and an abundance of red colouring along the trim and the underside of the keyboard. As a nice touch, i-Rocks has engineered a three-way cable channel into the bottom of the keyboard for whatever orientation you prefer, while of course keeping the lengthy cable as tidy as possible.



▲ The i-rocks Golem Series K50E is an exceptional keyboard

The K50E uses a scissor movement key switch, which involves two pairs of parallel arms that raise the keycap a good 3.8mm from its activation on the specially designed membrane. Yes, it is a membrane, but as with the K10, this is a keyboard that essentially 'feels' more like a true mechanical switch than a more traditional membrane.

The performance of the keyboard when in use is extremely good. The keys are nicely spaced, and the 3.8mm travel makes for a fluid movement across the keyboard – one that's very similar to that of a Cherry MX Brown switch. In addition, each key press is remarkably quiet, but you still get that pleasurable click with each depress, only somewhat dampened to reduce the higher pitch clicks from the mechanical counterparts.

We've mentioned in the past that it's how a keyboard feels to the individual that's more important than the numbers in the list of specifications. The K50E is thankfully one of the better keyboards we've used in recent years. In fact, only the

significantly more expensive mechanical keyboards could top the typing feel that we have with the K50E.

It's the simple design we like about i-Rocks' keyboards. Granted, it's lacking macro and media keys other than volume up, down and mute, but this is a high-quality keyboard and one that's driverless and responsive. Plus, you can pick one up for around £25 from the likes of Beyond Technologies, which is pretty good value.

The scissor switch performs well under pressure, and thanks



to the design of the membrane, it'll last you something like 30 million key presses before you need to consider a new keyboard. Therefore, if you're after a simply designed, low-cost, mechanical-like keyboard, with a high quality of engineering, then we'd recommend you take a look at the i-Rocks Golem Series K50E.

mm David Hayward

An excellent keyboard for an excellent price



Specifications

- Interface: USB or PS/2
- Keys: 108 (By language)
- Key stroke : 3.8 ±0.3 mm
- Key force: 55±15g
- Anti-ghosting:
 - 24 keys in PS/2 (in main area)
 - 13 keys in USB (in main area)
- Switch life: about 30 million life cycles
- Membrane key-switches with scissor-structure.
- Illuminated on/off function
- Electric current: 300 mA maximum
- Voltage: DC5V
- USB cable length: 180 cm
- Dimensions: 447 (L) x 144 (W) x 33 (H) mm

Toshiba Canvio Connect II 1TB

Toshiba unleashes yet more Canvio products on an unsuspecting world

DETAILS

- Price: £50 (Amazon)
- Manufacturer: Toshiba
- Website: goo.gl/0gR8gf
- Required spec: 750MHz CPU, 10MB disk space, 256 MB RAM
- Part number: HDTC810EC3AA

With Seagate and Western Digital knocking seven sorts of SATA out of each other, this should be a good time for the Toshiba to make more of its hard drive business. Its Canvio range of external USB storage devices has generally been solid, if somewhat unexciting, and the new Canvio Connect II doesn't break that particular mould.

The 1TB review model was described as being 'Satin Gold', but in many lighting conditions it looked silver to me. The Canvio Connect II comes also comes in black, red, blue and white, and 500GB, 1TB, 2TB and 3TB capacities.

While the finish does give the impression of metal, this is an entirely plastic construction that you're never meant to open, like so many portable drives these days. Inside, I suspect (although I couldn't prove it without a hammer handy), is a Toshiba MQ 2.5" drive, like the ones that normally make their way into numerous laptops.

The performance of this 5400rpm drive isn't amazing, but when connected to USB 3.0, it reads and writes at a very respectable speed of around 125MB/s.

That's quick enough to sync some documents smartly and



then catch a train, though it won't compare with the best SSD-based external drives.

The 500GB and 1TB versions are a svelte 14mm thick, whereas the larger 2TB and 3TB ones need additional platter space swelling them to 19.5mm. I'd certainly gravitate towards the thinner 1TB design, because its reasonable value for money and it only weighs 165g.

By way of other encouragements, Toshiba also bundles the drive with the NT Backup Now EZ application, a Mac NTFS driver (Tuxera) and a slightly odd utility called Pogoplug PC. What that software does is turn your PC into a personal cloud server,

so its contents can be remotely accessed and actively copied elsewhere. And, you also get 10GB of cloud storage to keep your most important files in the cloud, if you're short of space to do that.

To be brutally honest, these things are all nice, but my experience is that most users will erase the contents of the drive and just use its vanilla functionality.

In the final analysis, there isn't anything specifically wrong with the Canvio Connect II, nor much especially compelling either. If you want this much space in a portable USB 3.0 package, you can find it for a tenner

| | Read [MB/s] | Write [MB/s] |
|---------|-------------|--------------|
| Seq | 126.3 | 125.4 |
| 512k | 38.70 | 48.31 |
| 4K | 0.527 | 1.296 |
| 4K QD32 | 0.580 | 1.249 |

less elsewhere, and if you want better performance, it can also be found.

This model is quicker than the cheaper Western Digital and Seagate 1TB drives, though only by about 8%. What Toshiba needs to do is migrate some of its hybrid drive designs into these enclosures, and deliver a more dramatic performance boost.

Don't get me wrong; the Toshiba Canvio Connect II 1TB is a perfectly serviceable drive that most people will love. It's just entering a very crowded marketplace at this time, and it needed to do more to get noticed.

mm Mark Pickavance

Lightweight external drive with a decent capacity

micro mart

Quality 7

Value 7

Overall 7

Canon Pixma MX725

Canon's latest multi-function printer is designed for home and office

DETAILS

- Price: £104 (Ebuyer)
- Manufacturer: Canon
- Website: www.canon.co.uk
- Required spec: Windows XP or later, Mac OS X v10.6.8 or later, iOS, Android, Windows RT

Having just reviewed a HP multi-function printer, I was very interested in the different approach that Canon might take to the same problem. Its Canon Pixma MX725 is a beast of a box, measuring 491 x 396 x 231mm and finished in the sort of high-gloss black plastic designed to attract dust at range.

From the classic do-anything mould, it's a scanner, copier, fax machine, photo-printer and dish-washer. Okay, I lied about one of those features, and it wasn't faxing, sadly.

You can connect to it using wi-fi or a wired Ethernet LAN, and it supports all the popular cloud printing systems for mobile device output. There's also a USB port for dumping scanned files onto a memory stick or for printing from one.

The obvious missing network feature here is Bluetooth, which you can add with a USB

dongle at extra expense if you absolutely must have it.

Print quality is top notch, built around Canon's up to 9600 x 2400dpi five-cart system, providing black text

pigment plus CYMK. Matching the output strength, Canon added a 2400 x 4800dpi

scanner, with a 35-page document feeder.

Unusually for such a cheap device, there are also two paper bins: one that takes 250 sheets of up to A4 paper and a 20-sheet

you won't be throwing a triple-colour cart away with ink in it.

But it needs to be said that the good things in this design are a counterbalance to the physical enormity of the device, because it's huge, being so big that it only serves to underline some of the patent absurdities that Canon placed on the outside.

The most obvious of these is the tiny 2.5" display and associated keypad, presumably cobbled from old phone technology. If HP can put a very readable touch panel on its HP Envy 7640 for not a lot more than this price, then why can't Canon?

And I'm not sure why it was necessary for all the controls to be on a panel that hinges with the scanner cover? I discovered that ergonomics aren't a strong point here almost immediately, when the output tray automatically deployed, covering up the USB slot I then needed to access. There are three other entire sides for this port to go, so why put it under the output tray?



“ Photo printing in particular is exceptionally good ”

Specifications

- 250-sheet paper cassette and two-sided 35 sheet ADF.
- Wi-fi and Ethernet connectivity.
- Print from and scan to mobile devices with Pixma Printing Solutions app.
- Pixma Cloud Link, Google Cloud Print and Apple AirPrint support.
- A4 document 15 ipm mono / 10 ipm colour.
- Auto two-sided print, XL and XXL ink options.
- Prints up to 9600dpi and no waste with five single inks.
- Dual Function Panel and 6.2cm colour display.

tray built specifically for envelopes and smaller photo stock.

This is an almost identical specification to Canon's more expensive MX925 design, in all but the size of the control panel display and a few other minor differences, like the MX725 doesn't offer disc printing. Given that the MX725 is at least £40-50 cheaper, unless disc printing is an absolute must, the MX725 is a more cost effective option.

As multi-function printers go generally, I really appreciate the five-ink system here, as



Fax functionality is available for those people who have convinced themselves that 300dpi (200dpi in colour) images sent via analogue are far superior to scanned 2400 x 4800dpi ones digitally transmitted attached to an email.

However, if you can look past its elephantine girth and ill-conceived controls, inside

this giant black box is actually a rather good print engine and a decent quality scanner.

Photo printing in particular is exceptionally good, and it's reasonably quick considering the bewildering number of individual picolitres dispensed to produce a borderless A4 print.

The catch, and it's not exclusively a Canon issue, is the

depressing cost of ink printing, which isn't something even the wealthy should make a regular habit. Canon has tried to offset this somewhat by offering XL and XXL carts, demonstrating that it has a design that could be less expensive to run from the outset but, depressingly, isn't.

In its defence, Canon has four colour 'value' multipacks,

though it's yet to launch a monthly ink subscription service. Inkjet printing isn't cheap however you do it, though at least this printer uses CL-555, CL-551 and CL-550 carts, which are common to many other Pixma designs.

While I salute the dual paper sources, network options and high print quality, Canon really needs to ditch the dumb phone controls and scale this box down dramatically.

If it can do that and bring it in around this price, it will have an absolute winner on its hands.

mm Mark Pickavance

Massive multi-function inkjet with great photo output



Besiege

Lay waste to everything with a machine of your own creation

DETAILS

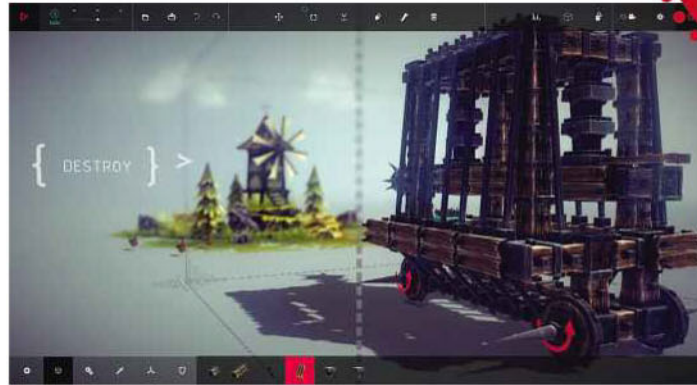
- Price: £4.99
- Manufacturer: Spiderling Studios
- Website: goo.gl/dD8GRA
- Required spec: Windows XP or later, Mac OS X 10 or later, Ubuntu 12.04 or later, 2.2GHz CPU, 2GB RAM, 512MB GPU

You can't fault the ancient Greeks. They had a cracking plan when it came to building a giant, hollow wooden horse in order to enter the city of Troy. Now if they were to include several flame throwers, a brace of cannons, some catapulting exploding mines and gave it the ability to fly back out over the walls of the city, then history may have been somewhat more appealing to high school students.

Thankfully, the Greeks missed out on that particular trick, but Spiderling Studios hasn't with its newest title, *Besiege*.

Besiege is a physics-based, build and destroy game with a spattering of puzzle solving and heaps of ingenuity and engineering skills. The concept of the game is simple enough: all you're required to do is use the many components you have available to construct a medieval machine of some description to complete a mission. However, the devil is in the detail here, and although your construction may look wonderful in its design phase, when it comes to actually being deployed for the situation at hand, you begin to realise that it'll never manage to get the job done.

The missions are based on a many-islanded planet; you simply pick the first island, which is then broken into sections, and begin



▲ *It doesn't matter if the machine is bewildering, as long as it works*



▲ *For any future engineers, this is well worth playing*

at the first level. Each level will usually have you destroying a certain percentage of a town, castle or monument, or it may have you wiping out a certain number of opposing guards, sheep or the general population. There are also missions that will have you moving objects from one location to a trickier one elsewhere or to simply get from point A to point B without dying.

The trick is being able to construct an incredible machine that will get the job done as effectively and as efficiently as possible. This takes some skill, and while you begin with a simple design, you'll soon be required to utilise more and more of the components at hand in order to achieve the goal of completing the mission.

You start with a single block, to which you can add more blocks, pistons, hinges, springs, wings, motors, wheels, armaments and an array of weaponry too. Building your machine is easy thanks to the glorious 3D modelling used throughout the game. You can rotate, turn, raise and lower the machine to add parts above, below and to the sides. In addition you can tweak each individual component to your own needs and specifications. For example, wheels can be key-bound and locked, so you can turn much like the caterpillar treads on a tank, and the speed of a wheel's revolution can be altered too. There's more, though, as springs can be pushed beyond their original



ability to store mechanical energy, and minute alterations to pistons and powered cogs can yield extraordinary results.

Graphically, *Besiege* is splendid. The 3D landscape and objects are wonderfully presented and display the physics element of the game to glorious effect. However, with this being still in its alpha stages, there are moments of dodgy camera work, and you do get caught in the occasional glitch from time to time. You can limit some of the graphical detail, though, such as the blood splatter from mowing into an army with a rotating saw or reducing the shadows.

Although an alpha build, *Besiege* is pure fun. The machines you build can be as ridiculous as you wish; no one cares as long as they get the job done. And working out the engineering complexities of a catapult is something every student needs to experience.

For a mere £4.99, *Besiege* is one game that may change your mind about Greenlight and alpha builds. It's enormous fun, and we can't wait for more updates.

mm David Hayward

Immense fun, with more content to come



Wolfenstein: The Old Blood

Prepare to have a blast with this all-action shooter

DETAILS

- Price: £14.99 from Steam
- Manufacturer: Bethesda
- Website: www.wolfenstein.com
- Required spec: 3.3GHz quad-core processor, 4GB RAM, 38GB disk space, Nvidia GeForce GTX 560 / AMD FX-8320, Windows 7 or later (64-bit)

It's been a year since *Wolfenstein: The New Order* was released, to critical acclaim and strong sales, and now it's time for another helping of Nazi-bashing action. But rather than releasing a full-blown sequel (a tall order for 12 months' work), Bethesda has opted, with *The Old Blood*, to give us a £15 expansion instead. So if you've been dying to once again get behind the guns of William 'BJ' Blazkowicz, the wait is over. And because it's a stand-alone title, you don't even need to have played its predecessor to join in the fun.

Set before the events of *The New Order*, this prequel sees you on a mission to uncover the location of General William 'Deathshead' Strasse, the main villain of the first game. Frankly, though, while the acting is good, the plotting isn't as strong here as in *The New Order*, and you don't feel anywhere near the same kind of emotional investment. Considering its price, though, it's impressive there are any cut-scenes or story at all.

Anyway, it's the gameplay that matters here, because with *The Old Blood*, it's all about the action. You run, you gun, you throw grenades and you kill virtually anything that moves. From machine guns to



ludicrously big shotguns, there's a wide range of weapons to choose from, and which ones you opt for will largely be shaped by your tactics. As with *The New Order*, you can charge in, all guns blazing, or you can play the game stealthily, using knives, a metal pipe and your silenced pistol. Take out the commanding officers without being spotted, and they won't

be able to call for backup. If they do see you, be prepared to face numerous waves of enemies, who won't stop coming until you've taken out the commanders. Of course, if you're anything like us, the whole stealth thing will bore you to tears, and going loud is without doubt the way forward. The choice, of course, is up to you.

As you progress, you can complete challenges to gain upgrades for your character, weapons and armour. This is hugely cut down compared to *The New Order*, but that's to be expected. Indeed, that pretty much sums up this game in general: a condensed version of its predecessor, with all the fat trimmed off. What you're left with is a high-quality, fast-paced, old-school shooter.

If you really wanted to criticise *The Old Blood*, you could point out that it's fairly short, lasting around six hours (obviously it'll last longer if you play on a higher difficulty level). But that wouldn't be particularly fair, because its price reflects this fact, plus there's a challenge mode to give you more to do once the campaign is over. Compare that to, say, the expansions for the *Call of Duty* games, which cost about the same but consist of merely a few multiplayer maps, and you can see what a bargain this is. Indeed, in spite of the fact that it's not a full release, it lasts about as long as the average *CoD* campaign mode does, and those games cost about £50 when they're released. There's no multiplayer, sure, but if you're after a decent single-player shooter at a reasonable price, look no further.

mm Anthony Enticknap

A cut-down expansion but brimming over with fun



GROUP TEST

Micro PCs

These days, a decent-powered PC doesn't have to be housed inside a towering monstrosity of a case. System builders, home users and even businesses are looking to reduce the footprint of their hardware, and this is where the micro PC comes in.

Considering the sizes of a modern micro PC, there's a lot going on inside. David Hayward therefore clamps his great sausage-like fingers around six tiny PCs, to see which are worth your time and money.

Micro PCs

Gigabyte Brix S GB-BXi5H-5200

DETAILS

- Price: From £190
- Manufacturer: Gigabyte/Ambros.co.uk
- Website: goo.gl/K06Qil (Ambros) / goo.gl/M6re5R (Gigabyte)
- Required spec: Keyboard, mouse etc.

It's quite remarkable how much power you can squeeze into such a tiny space these days. We're continually impressed with what micro PCs can offer and what the manufacturers have somehow managed to shoehorn into the diminutive measurements of such a compact design.

The latest tiny model through our doors is the Gigabyte Brix S GB-BXi5H-5200. This ultra-small case packs an extraordinary punch, with the model we have available featuring an Intel Core i5-5200U, 8GB of DDR3L SO-DIMM 1600MHz memory, Intel HD5500 GPU, a Kingston 120GB mSATA SSD and a 1TB Samsung hard drive on which there's a copy of Windows 8.1.

Furthermore, you'll find four USB 3.0 ports – two at the rear and two at the front – HDMI, mini-DisplayPort, headphone jack, gigabit Ethernet, 802.11 ac wi-fi, Bluetooth 4.0 and a separate VESA mount for fitting it behind a monitor or TV. All of this, mind you, is inside a case that measures just 46.8 x 107.6 x 114.4mm.

The specification above has been provided by Ambros.co.uk, a retailer that specialised in mini-PCs. Gigabyte itself provides the barebone system to various online stores, so you can customise it however you see fit and alter the price accordingly.

This gives you far better control over what the system will be intended for, whether that be as a living room, gaming system or a media centre. Suffice to say, the project potential for a system of this power and this size is quite exciting.

Despite this being an extremely small computer, the Brix is remarkably fast and quiet too. The decent i5-5200U is the same kind of processor we generally see in some gaming laptops. It's a good choice, but be under no illusions that it's going to perform at the same level as its desktop brethren.

However, there's no reason why the Brix, our review version at least, can't trade gaming blows with a desktop system. We managed to enjoy several of the more recent games available, including *Sniper Elite 3* and *Elite: Dangerous*, with the settings reasonably high, and we didn't suffer any noticeable glitches or lag. True, you won't be able to play at the highest settings, but considering the setup and where it can be located, it's not all that bad.

For everyday use, the Brix works very well indeed. Normal duties, such as word processing, browsing, photo editing and even a spot of lightweight video editing were well within the capabilities of the system.

Lastly, playback of HD content was perfect. We streamed a number of Blu-ray

quality media through the Brix using VLC, and it didn't even break into a sweat, even when hooked up to a 4K monitor and pushing the graphical limits.

The mini-PC market has well and truly taken off now and the competition is getting better by the week. Thankfully the Gigabyte Brix can hold its own, for the moment at least. It's certainly one of the most powerful ultra-small PCs we've tested in recent months. The build quality, again down to Ambros.co.uk, is exceptional and just goes to prove that there's more life in the PC than the doomsayers would have you believe.

All in all, a great mini-PC with enough performance to fit the bill for all manner of projects and setups.



◀ The Gigabyte Brix is tiny, yes. But inside it contains the heart of a full sized desktop

Hannsree Micro PC

DETAILS

- Price: £160
- Manufacturer: Hanspree
- Website: goo.gl/qUqSNC
- Required spec: Keyboard, mouse etc

The Hanspree Micro PC is an extraordinary palm-sized device, complete with a quad-core 1.83GHz Intel Atom Z3735F, 2GB of DDR RAM, Intel HD Bay Trail graphics and 32GB of Samsung eMMC NAND storage. Furthermore, there's Bluetooth 4.0, 802.11 b/g/n wi-fi, a micro-USB port for power, a full-sized USB 2.0 port and a micro-SD card reader to further expand the storage. Ingeniously, all this manages to fit into a shell measuring just 110 x 38 x 9.8mm and weighing 38 grams.

The Micro PC consists of a hard, piano-black glassy shell, with the aforementioned ports dotted either side, in between some small heat exhaust vents. It terminates at one end with a protruding HDMI connector, next to which is located the tiny push power button.

The Micro PC comes with a copy of Windows 8.1 the Bing Edition pre-installed. All you need to do is simply plug the HDMI section of the device into a relevant socket in your TV or monitor (there's an HDMI extension cable provided in the box), and provide power through the micro USB port with the supplied 5V 2A power adapter.

The Micro PC is also surprisingly quick, considering its diminutive dimensions. Booting the OS takes a tad less than 16 seconds, and once in the desktop, the UI is extremely smooth and perfectly operable.



► *The Hanspree Micro PC is an amazing PC on a stick*

▼ *But when next to other mini PCs, it starts to show the strain*



Furthermore, when connected to our network, browsing our video collection on the NAS drive worked a treat, as did normal internet duties.

We tested the Hanspree Micro PC with a selection of HD films, all of which played perfectly well thanks to the good hardware h.264 video decoding built into the Atom processor. At full 1080p there wasn't any hint of a struggle from the tiny computer, making this an interesting media centre PC.

The Micro PC isn't the best gaming platform to ever grace the back of a TV or monitor, but it has enough performance to play some older titles, ones

from a few years ago at least and, of course, the likes of Minecraft play well enough with some of the more feature-laden settings set slightly lower than normal. And the potential as a retro emulation machine is simply too much to ignore.

The Micro PC did get a little warm to the touch after we had finished putting it through its paces. Obviously there isn't a fan hidden somewhere in the case, so all heat has to be pushed through the tiny ventilation holes on the sides of the device. This isn't too much of a problem, though, despite how it sounds. Although it was warm to the touch, the Micro PC never overheated, even

when left dangling around the generally poorly ventilated back of the TV.

At £160 or thereabouts depending on where you shop, the Micro PC may seem a little expensive, considering there are some limitations with regards to its power and connectivity. It begs the question, then, whether this is more of a novelty item, rather than something you could use effectively. In our humble opinion, it's very good, and provided you use it as a tool for a specific job, it'll serve you just fine.



Micro PCs

Minix Neo Z64 Windows 8.1

DETAILS

- Price: £129
- Manufacturer: Minix
- Website: goo.gl/GClbcN
- Required spec: HDMI connection (cable included)

The Neo Z64 is the newest entry in the small PC range from Minix, and it's one we've reviewed in the past. It impressed us, quite a lot as it happens, but how will it fare when up against the competition?

The Neo Z64 features an Intel Z3735F 64-bit processor running at 1.3GHz, 2GB DDR3L memory, Bay Trail graphics at 646MHz and 32GB eMMC of flash storage on which Minix has pre-installed a copy of Windows 8.1 Bing Edition.

In addition to the above, the Z64 has 802.11n wi-fi, Bluetooth 4.0, an HDMI 1.4 port, 100Mbps Ethernet port, micro-SD card reader and a pair of USB 2.0 ports. All that packed into a device that measures just 115 x 155 x 20mm.

The Neo Z64 is a neat little black box, with Minix debossed into the top of the unit. There's a large wi-fi antenna protruding from the left of the unit, with the HDMI, power, Ethernet and headphone socket at the rear, and the two USB ports, micro-SD card reader and power button located on the right-hand side.

Booting the Neo Z64 takes mere seconds and once in Windows 8.1 the desktop is snappy and usable, with about 20GB free on the eMMC flash storage after Windows has taken its share of the space. Naturally, the processor in the Neo isn't going to allow



▲ The Minix Neo Z64 may be compact, but it's worth every penny spent on it



▲ There's a lot of potential here

you to play the latest triple-A games, but it is capable of running a few modest titles without too much difficulty. *Minecraft* at a lower setting was perfectly fine, and since our love of retro gaming is a constant draw for us, the Z64 was a most impressive unit. In addition to that, standard

office applications and viewing images worked without any hint of a struggle.

We were quite impressed by the fact that despite being left powered on for several hours and through playback of the aforementioned HD content, as well as various installations, configuring and updates, the

little Neo was barely warm to the touch.

As a media centre, the Neo Z64 is excellent. It's quiet, quick and superbly presented. We tested it on our home network setup, and playback from the networked NAS drive was as good as you could wish for – at as high a resolution as the connected TV could handle.

There are countless uses where the Minix Neo would shine. We mentioned in the review we did previously of its worth as a terminal PC in offices, but there's also the potential as a stable Windows build in confined places and not just for entertainment purposes.

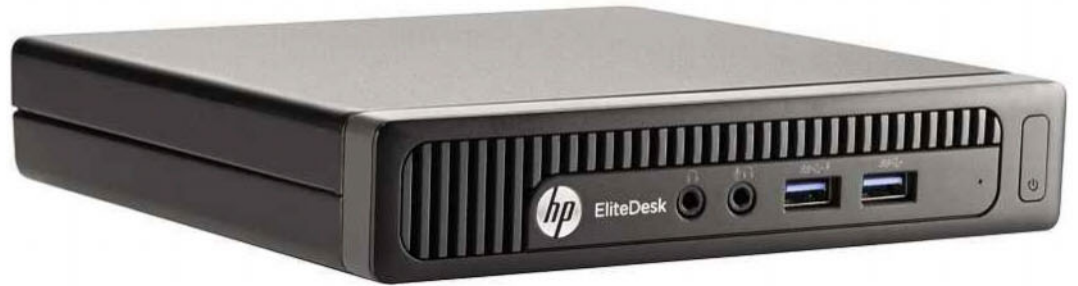
In conclusion, we think the Minix Neo Z64 is a fantastic micro-PC, one that ticks all the right boxes and offers the average Windows user a far better alternative over the traditional desktop. It may lack the raw power of the Gigabyte Brix, but its design and performance is enough to have it stand toe to toe with the best.



HP EliteDesk 705 G1 Desktop Mini PC

DETAILS

- Price: £365
- Manufacturer: HP
- Website: goo.gl/5odlb1
- Required spec: Keyboard, mouse, monitor or TV with DisplayPort or a DisplayPort to HDMI adapter



▲ The HP EliteDesk is really more of a business-orientated PC



▲ Connectivity is limited and a little specialised for the home user

The HP EliteDesk Mini PC is a part of the 705 G1 range of desktop PCs, aimed mostly at the larger, enterprise business user. However, that doesn't necessarily mean that the small office or even home user can't enjoy its diminutive dimensions.

There are a number of G1 models available, and this particular 705 version features an AMD A4-7350B APU at 3.4GHz, 4GB of 1600MHz DDR3 memory and a 500GB 7200rpm hard drive, with a copy of Windows 7 Pro.

The front of the 705 G1 houses the power button as well as a pair of USB 3.0 ports, headphone and mic jacks. The rear of the unit is a little busier, with a further two USB 3.0 ports, two USB 2.0 ports, VGA, two DisplayPorts, audio out jack and a gigabit Ethernet port. There's also a thumbscrew to unlock the top of the case and gain access to the interior.

Inside there are a couple of M.2 expansion slots available, where you can connect a wireless card and any M.2 storage drives you may wish to install instead of the spinner – or to complement it. Naturally, it would be nicer to have wi-fi and Bluetooth out of the box, and it's a little surprising the 705 G1 didn't.

The lack of an HDMI port may also turn off one or two users as well. DisplayPort is fast

becoming the standard for a lot of screens, but there are still plenty of monitors that don't support this port, which means the user will need to purchase a converter or stick with VGA.

We found that although the specification of the 705 G1

and we were able to open up a program without affecting the performance of the PC.

In terms of lightweight gaming, the AMD A4 Kaveri APU didn't fare too well. Even some of the older games we tried stuttered and lagged to the

monitor and TV we had the unit attached to lacked a DisplayPort connection, so we were forced in this instance to use VGA, which degraded the quality of the display somewhat. But the content played well enough via our NAS setup on the network.

The HP EliteDesk 705 G1 Desktop Mini PC probably isn't the best choice of micro PC for the average user. At £365 it's rather expensive, compared to the rest on test, and it lacks the necessary punch to make it worth it.

“ The lack of an HDMI port may also turn off one or two users ”

is okay on paper, in reality it was a little slow. Windows 7 Pro worked fine when it finally booted and loaded up its start-up programs, and once we'd installed VLC and a few other applications, it breezed along well enough. But getting to that point seemed to take an absolute age. In fact, it was a good five minutes before the drive had finished churning away

point of being unplayable, and we saw the same with *Minecraft* at low settings. It's a little odd really, as the specification of the processor, RAM and so on should have been more than a match for even a relatively modern game, but there was something blocking the overall performance.

As for media, the 705 G1 did a good enough job. The



Micro PCs

Asus VivoPC VC60V

DETAILS

- Price: £500
- Manufacturer: Asus
- Website: goo.gl/1AaN4N
- Required spec: Keyboard, mouse etc.

The VivoPC VC60V takes a lot of its design inspiration from the now defunct Dell Zinio. Since it's now roughly the same age as the Zinio, and the VivoPC has survived its trial by users as opposed to the Zinio, which didn't do so well, we thought we'd stand it toe to toe with the more modern mini PCs.

Within its diminutive case you'll find an Intel Core i5-3320M dual-core 2.6GHz CPU, 4GB of DDR3 1600MHz SO-DIMM RAM and a laptop specified 5400rpm 500GB hard drive. Graphics are handled via the motherboard's integrated Intel HD 4000 chipset and other features include a 2-in-1 card reader, built-in wi-fi, Bluetooth 4.0, four USB 3.0 and a pair of USB 2.0 ports, HDMI and Mini-DisplayPort and a set of built-in SonicMaster speakers. There's also, oddly enough but considerably handy, a serial port present.

It's a rather flashy-looking design and is available with either a traditional black brushed metal finish or a more tantalising polished aluminium finish. Popping the lid off reveals the storage compartment for the hard drive, which slots into place through the use of a set of four rubberised supports that keep down vibration and suppress any sound, as well as holding everything in place. There's a caddy available that

▲ The Asus VivoPC is certainly a sleek-looking mini PC



▲ Sadly, it's extraordinarily expensive for what you get

will allow you to fit smaller SSD-sized drives and room for more memory if required. Considering it's a micro PC, it's actually quite upgradable.

The VivoPC came with a copy of Windows 8.1 installed, the Bing Edition no less, into which it booted remarkably quickly. After that, pretty much everything we threw at it was handled at a reasonable pace, from lightweight gaming through to modern titles that are a little more taxing, to image and video editing as well. The speeds weren't as fast as an equivalent desktop, however, as

to be expected to some degree, but considering the size of the unit and its under-TV type appeal, it certainly did okay.

Speaking of being under a TV, the media capabilities were perfectly fine too. There's everything you'll need out of the box here to get up and running, bar the installation of a better media player. It handled the HD content on our NAS drive without breaking into a sweat, although the HD4000 GPU can't handle 4K content. Suffice to say, the media centre abilities of the VivoPC aren't in question.

The main issue here is the price. At around £500, this is an extraordinarily expensive machine. True, its neat design and decent specifications have it on a par with the previously reviewed Gigabit Brix, but we have to question the fact that it's actually worth that amount to begin with.

The Asus VivoPC VC60V is a great micro PC and one that will no doubt draw one or two jealous glances as it sits under your TV. But overall it's far too expensive a PC for the average user to have simply for basic media centre duties.



Acer Revo One RL85

DETAILS

- Price: £240
- Manufacturer: Acer
- Website: goo.gl/kUOxAS
- Required spec: Cables needed to connect to TV/monitor, mouse/keyboard remote already supplied but you'll need to use a traditional one to begin with



▲ Performance is okay, although there are cheaper alternatives

We've had a soft spot for the Acer Revo range of nettops ever since the old Revo R3610 with its Nvidia Ion GPU and slimline mini PC design. Things have moved on, though, and now Acer has to offer the much improved Revo One RL85.

The Revo One comes with an Intel Celeron 2957U dual-core CPU running at 1.4GHz, 4GB of DDR3L memory and a 1TB 5400rpm hard drive on which you'll find a copy of Windows 8.1.

Around the back of the Revo One you'll find four USB ports, two of which are version 3.0 and two 2.0, gigabit Ethernet, HDMI, mini DisplayPort and audio out. In addition to that, connectivity is also supported with wi-fi 802.11 b/g/n and Bluetooth 4.0.

The design of the Revo One is quite different from the previous versions of the Revo line. Rather than being a slimline nettop, this time Acer has decided on a sleek, pristine white shiny finish, with soft curves reminiscent of one of those night-light, soft glow things younger children have in their bedrooms. Added to that of course is the fact that it fits in the palm of your hand, giving it a tasteful overall effect. You'll also get

▲ The Acer Revo One: it's cuteness in the palm of your hand

a wireless dual-sided remote, with one side having a d-pad setup, with media and mouse action buttons, and the other side housing a rubberised qwerty keyboard.

Aside from the flashy exterior, there's a lot more going on inside the Revo One. For example, it uses a hot-swap

without too much difficulty. Newer games, though, sadly have too much of an impact on the strained resources of the Revo One, but since you can swap out the drives, there's always the possibility to quickly drop in a previously installed Linux drive and enjoy some alternative OS gaming.

“ Aside from the flashy exterior, there's a lot more going on inside ”

drive setup, where you can easily plug in an extra drive in one of the dual drive bays. You can even get to the RAM slot and wireless card relatively easily too for an upgrade at a later date.

The performance of the Revo One is reasonably good. It's not as powerful as the Gigabyte Brix or the Asus VivoPC, but it does manage to play some older games

Everyday duties are handled well enough, and the likes of image editing with some very light video editing is also well within the realms of the Revo One's abilities. Where it shines, though, is as a media centre. The specification is more than enough to enjoy some 4K content, as it states in the blurb we received. Unfortunately we didn't have access to a 4K monitor or TV

to test this out on, so we'll recommend you get this fact tested before committing to a buy if this is a driving factor for you.

The Acer Revo One RL85 is a great micro PC. It looks very flashy, there are a few promising hardware elements to it and it can perform well enough too. It's not too badly priced either, at around £240. That may sound like a fair chunk of the housekeeping, but when you consider the media capabilities and its, excuse the phrase, 'cuteness factor', we think it's well worth considering.





Gigabyte Brix S GB-BXi5H-5200

The Gigabyte Brix has plenty of upgrade options, a good base price and lots of performance from a tiny and neat chassis.



Minix Neo Z64 Windows 8.1

The Minix Neo Z64 continues to impress us. It may not be the most powerful mini PC in production, but it's solid and dependable, as well as being quiet and an excellent base for countless projects and uses.

How We Tested

Each mini PC was tested with a selection of games such as *Elite: Dangerous*, *Sniper Elite 3*, *Minecraft*, *Assassin's Creed 2*, as well as a collection of older system emulators.

We also tested each machine with Windows Movie Maker, Gimp, LibreOffice and Office 2013. In addition, we installed the latest version of VLC to test HD video playback from a NAS drive.

| | Gigabyte Brix S | Hanspree Micro PC | Minix Neo Z64 | HP EliteDesk 705 G1 Desktop | Asus VivoPC VC60V | Acer Revo One RL85 |
|---------------------|---------------------------------|--------------------------------|-------------------|--------------------------------|--------------------------------|---------------------------------|
| Price | £190 | £160 | £129 | £365 | £500 | £240 |
| CPU Type | Intel i5 | Intel Atom | Intel Z3735F | AMD A4 | Intel i5 | Intel Celeron |
| CPU Speed | 2.4GHz | 1.8GHz | 1.3GHz | 3.4GHz | 2.6GHz | 1.4GHz |
| RAM | 8GB | 2GB | 2GB | 4GB | 4GB | 4GB |
| HDD | 120GB SSD/1TB HDD | 32GB eMMC | 32GB eMMC | 500GB HDD | 500GB HDD | 1TB HDD |
| Installed OS | Windows 8.1 | Windows 8.1 | Windows 8.1 | Windows 7 Pro | Windows 8.1 | Windows 8.1 |
| No USB Ports | Four – 2 x USB 3.0, 2 x USB 2.0 | Two – 1 x USB 2.0, 1xmicro USB | Two – 2 x USB 2.0 | Six – 4 x USB 3.0, 2 x USB 2.0 | Six – 4 x USB 3.0, 2 x USB 2.0 | Four – 2 x USB 3.0, 2 x USB 2.0 |
| HDMI | Yes | Yes | Yes | No | Yes | Yes |
| VGA | No | No | No | Yes | No | No |
| DVI | No | No | No | No | No | No |
| Wi-fi | Yes | Yes | Yes | Optional | Yes | Yes |
| Bluetooth | Yes | Yes | Yes | Optional | Yes | Yes |
| Ethernet | Yes | No | Yes | Yes | Yes | Yes |

Your Letters

Linux Or Windows?

While I respect Dick Pearson's preference for Windows over Linux (ref: 'Why I Use Windows', MM1361), I felt that I should correct some of the points that he made.

Firstly, if Dick doesn't wish to install Linux for himself, he can certainly buy a PC with Linux pre-installed. I suggest that he googles 'PC with linux installed'. Actually, Linux can be very easy to install and, given a recent mainstream distro, most necessary hardware drivers will be included, along with most of the application software that might be needed – so much simpler and far less time consuming than faffing about installing a Windows OS and then after this, having to sort out all of the other application stuff along with drivers, activation keys, etc. I've tried to make this last point on previous occasions, but Windows users just don't seem to get it.

Secondly, Dick seems to believe that Windows Script Host should be considered to be on a par with Linux's bash. I've not used WSH,

but Wikipedia suggests that bash is far more powerful than WSH. Yes, (most) bash-like commands can be made available under Windows by installing Cygwin; I have used Cygwin under Win XP but IMHO it's not as satisfactory as using the real thing under Linux – and a full Cygwin installation will occupy over 1GB.

I'm not going to bother commenting on the finer (personal) points relating to sidebars, except to point out that if you don't like the way a Linux desktop looks, then you can usually change it, or even choose a totally different desktop manager.

Like Dick, most of the computer users that I interact with use Windows, but that doesn't give me any problems, because if necessary, under Linux I can easily translate file formats to/from those used by MS Windows applications.

I don't 'play' with Linux. I USE it as my main OS and much prefer it to anything that I have seen from Microsoft.

Ken Hough

Movie Pricing

Before we had streaming video services like Netflix, I owned a small collection of DVDs and VHS tapes before that. When I say small, I mean it. I had perhaps 20 films in total and a boxset of the original *Star Trek*. The films were all things that I'd be guaranteed to watch, but most of the time, I'd prefer to watch something new.

I suspect a lot of people, like me, don't really see the point of ownership of media, so Netflix and the like are perfect. I'm certainly not going to pay £12 or whatever to buy a film on disc, just to watch it once.

The thing is movie studios and TV networks don't seem to get that's how many people think. They say people just want things for free, but that's not completely true, is it? If it were, Netflix wouldn't have

any customers, but it does and it makes enough money to produce its own media.

It makes me laugh, then, when I see on iTunes the prices for renting and buying films. Why would I pay that much for film that doesn't come with a case, hard media or artwork? Why isn't there a discount? And the rental prices often cost nearly as much as I pay for Netflix every month.

Speaking of the price, I'd be happy to pay more for it, to be honest. It's just like paying for Sky or any other subscription service, but I get to choose what I watch and when. And if I want to watch an entire series over a few days, I can do that too - without endless adverts and home improvement shows.

Leigh Green

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The Pursuit Of Music Perfection

Roland Waddilove shows where you can download lossless studio-quality audio files and hear music the way the artists performed it

How good is the music you listen to? This is not a question about your favourite artist, whoever that may be, but the quality of the audio. You might think that the music you listen to sounds okay, but it's surprising how poor most music is. You would be amazed at the difference if you heard how music really sounds.

For some people, only the best quality music is acceptable, and they want to hear it like they were in the same room as the singer or musician. The pursuit of music perfection has two components: the physical equipment the music is played on and the quality of the audio itself.

Some people do not notice the audio quality, or lack of it, and if you listen to your music from the tiny speaker on your mobile phone, then music quality is not an issue. Even if you listen on reasonably good earphones or a home stereo system, the audio quality is not perfect.

CDs are regarded by many people as representing the best audio quality, but even these are a compromise. For some people, often called audiophiles, only the best is acceptable. They invest in top-quality audio hardware and seek out studio-quality music files. The combination of the two produces the perfect audio experience, and you may be surprised to discover it sounds nothing like the audio you normally listen to on your phone, computer or music player.

This article is not about the hardware you need to reproduce the studio sound experience, but will look at the other issue: sourcing high-quality audio files. There's no point in spending lots of money on top-end audio equipment if the files you play are less than perfect. Upgrading your music library and replacing low-quality files with high-quality ones is the first step to getting better music.

Where can you download studio masters? Who sells better-than-CD quality audio? Can you stream it? Is a CD not a perfect reproduction of the music?

There are two types of music file, which can be categorised as lossy and lossless. You could argue that all digital music is lossy, and the act of digitising it loses some of the analogue information in the original audio, but some file formats are a lot worse than others.

Audio quality can be measured by the number of bits, the sample rate and, in the case of streaming music, the bits per second (bps). More bits and higher sample rates produce better quality audio. The downside is that files are very large: around a gigabyte per album. In the early days of portable music players and the internet, device storage and bandwidth were limited. In order to store music or stream it, compression was required, and it wasn't possible to work with raw audio files.

MP3 was one of the first popular audio file formats, and it reduces the size of audio files partly by compression and partly by discarding information. Bit rates of 96Kbps were common for audio files, and



▲ **Download 1GB of high-quality free tracks from hdtracks.com and hear the difference**

quality suffered. You might not realise by how much unless you listen to a 96Kbps MP3 and a CD of the same music. Even now, 96Kbps music is still used – for example, if you listen to streaming music on a mobile phone.

Lossy audio file formats like MP3 are avoided by audiophiles because of the way they mangle the music, so lossless file formats like WAV and FLAC are sought. These are better because no audio information is lost, discarded or compressed. There's a direct comparison in photography, with JPEG images, which save space by compressing and discarding image information, while .bmp, .tif, .png and other lossless formats are pixel perfect. MP3 compression has a similar detrimental effect on audio.

“ Who sells better-than-CD quality audio? Can you stream it? Is a CD not a perfect reproduction of the music ”

Increasing the bitrate improves the audio quality, and 128Kbps became the standard for music downloads and streaming, then 196 and finally 320Kbps. If you're listening to streaming music or audio downloads that are 320Kbps, you might think that the music is perfect, but it's not. In fact, it's a quarter of the bitrate of a CD.

A CD offers 44.1 kHz 16-bit samples per second, and it sounds pretty good, but audiophiles want even better. Increasing the number of bits to 24 and the sample rate to 96KHz or even 192KHz produces noticeably better quality audio, provided of course that you have the audio equipment to faithfully reproduce this.

Let's take a look at some of the places you can find high-quality music downloads and streaming.

Deezer

Deezer (deezer.com) is a popular music streaming service, and if you subscribe, you have access to music at 320Kbps. This is good enough for the masses but not audiophiles. However, there is a way to stream Deezer at 1,411Kbps (CD quality), which is a huge step up, as can be seen in the fourfold better bitrate.

The streaming music company offers an Elite service, and Sonos (sonos.com) wireless hi-fi systems are compatible with Deezer Elite. This enables you to play high-quality audio in your home. Deezer's



▲ **Buying a Sonos wireless hi-fi? Get Deezer Elite lossless audio for no extra cost**

massive streaming library of 35 million tracks, which covers every genre in depth, is actually stored in lossless FLAC format and can be streamed to Elite subscribers with Sonos kit. The company says a survey showed that 91% of Elite users can hear the difference and that 65% of users would never go back to ordinary MP3 audio after having tried it.

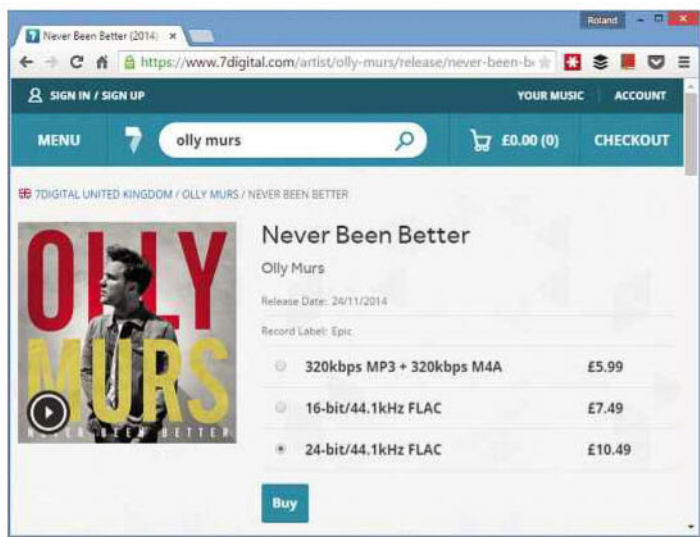
At the moment, Deezer Elite is only available for Sonos hi-fi owners (deezer.com/offers/elite) and not for regular users streaming to PCs, phones and other music players. Sign up for a Deezer Premium+ account and buy a Sonos system, and you'll receive an email offer to upgrade to Elite. When paid for annually, Elite costs no more than regular Deezer, which is a bargain.

7digital

7digital (7digital.com) offers a variety of services, including business to business, but also among them is an online music store that provides high-quality audio downloads to the consumer. The company has a catalogue of 32 million audio tracks, but it does not say how many of these are in high-quality lossless format.

Is your favourite artist available? You will just have to search and see. There seems to be a mixture of regular 320Kbps downloads and high-quality FLAC in 16-bit and 24-bit 44.1kHz formats. Out of six Taylor Swift albums, three were 16-bit FLAC, and three were 320Kbps MP3 downloads. Olly Murs was similar, with a mixture of regular MP3s and 16-bit or 24-bit FLAC downloads. So not





▲ Select the quality and price you want for downloads from the 7digital website



▲ Fancy a bit of classic rock from ZZ Top at 192kHz/24-bit from HDtracks?

everything is available, but there are certainly some current artists and lots of older albums and artists.

The prices vary from album to album, but to give an example, Olly Murs' *Never Been Better* is £5.99 for 320Kbps MP3, £7.49 for 16-bit 44.1kHz FLAC (CD quality) and £10.49 for 24-bit 44.1kHz FLAC (better than CD). For an extra £1.50 on the price, it makes sense to go for the CD-quality download.

The website is dull but easy to navigate, and the menu bar at the left enables you to access featured music, deals of the week, new albums and all the music genres. Albums and tracks in 16-bit or 24-bit FLAC are clearly marked. Music previews are available, and there's a search facility to find your favourite artists and albums. This is a useful source of high-quality audio.

HDtracks

HDtracks (hdtracks.co.uk) specialises in high-quality music downloads, and it doesn't bother with MP3, because it just isn't good enough. The audio formats available are all lossless FLAC, ALAC (Apple's version of FLAC), WAV and AIFF (another Apple format). The audio is at least 96kHz 24-bit, but some of it is in 192kHz 24-bit, which is classed as studio quality, and it goes up to 9,612Kbps. Compare that to the usual 320Kbps that you get with MP3 downloads and regular streaming services. It's seven times better than CD quality. It's the sort of audio that professional sound engineers use, and it contains much more information than regular music.

A free 11-track sample album in 96kHz 24-bit format can be downloaded, and it's worth your trouble if you aren't sure whether you'll be able to hear the difference between regular and high-quality audio.

The website's insistence on high-quality audio only (the lowest is 24-bit/44.1kHz – better than CD) means there's a lot less music than at a regular store or streaming music service. Search for popular artists, and you might find only one album. Prices are high too, reflecting the quality. This is bad news if you want the latest pop tracks, but if you're into Russian violin concertos, you can download them in an astonishingly high 352kHz/24-bit file format. That's amazing.

This is a website for true audiophiles, where only the highest-quality is available. The navigation bar on the left provides access to recently added, rock, jazz and classical best sellers, top hi-res female artists, a category called British Invasion, rock through the decades and more.

HD tracks is best for older albums rather than the latest chart-topping releases, and there is a great selection of music from all

genres. However, the prices are steep, and can be up to £25. For some people, though, price isn't an issue, and if you want the best, this is a good website with high-quality downloads.

Qobuz

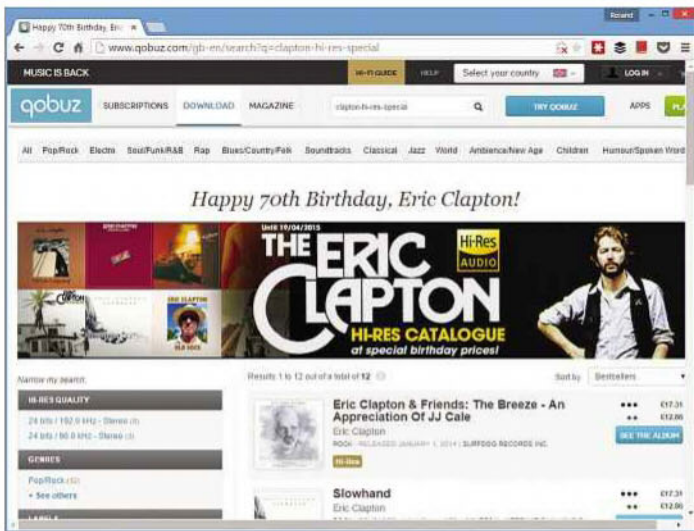
Qobuz (qobuz.com/gb-en) aims to be all things to all people, and it does everything. You can buy downloads or you can subscribe to streaming music, you can get regular or high-quality audio, and there's both new and old music, classic albums and alternative. It has everything and mostly in high quality.

“ If you're listening to streaming music or audio downloads that are 320Kbps, you might think that the music is perfect, but it's not ”

There are four streaming music service options, with a fifth coming soon. Qobuz Basic costs £4.99 a month and provides access to 24 million tracks MP3 tracks at 320Kbps, but it only works on desktop PCs. Add mobile access for phones and tablets and the price rises to £9.99 a month. Qobuz Hi-Fi Classical provides access to streaming classical music in 44.1kHz/16-bit FLAC CD quality for £14.99 a month, but for an extra £5 a month you can access all 24 million tracks on the service.

Music can be purchased and downloaded from the website too, and the quality is up to an excellent 192kHz 24-bit. It does vary a lot, though, and not every album is such high quality. Some are merely CD quality 44.1kHz/16-bit. There's plenty for the audiophile looking for great music, though, and with 24 million tracks, there's plenty of choice. Top artists are there as well as classic albums, with everything from Mozart to Ed Sheeran.

With CD-quality downloads as the minimum, prices are higher than for sites with regular MP3s and higher still for top-quality downloads. However, it's cheaper than some stores. The website is excellent and well designed, with lot of artwork, album and artist information and so on. It looks great and is easy to navigate.



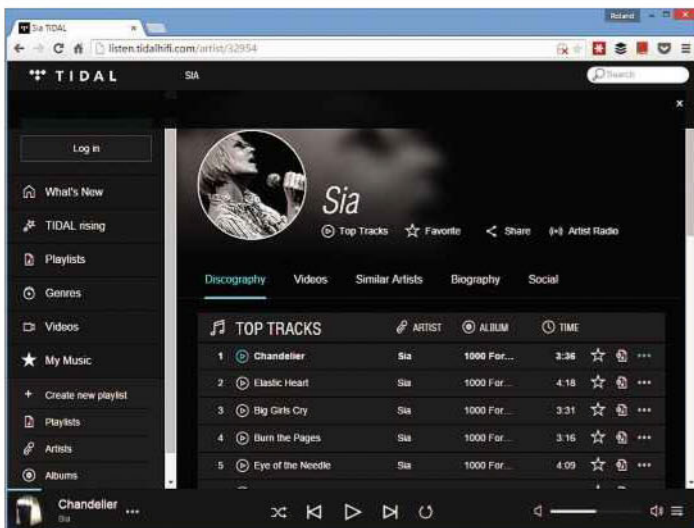
▲ Qobuz has a wide range of music high-quality downloads and streaming options

There's a new service coming soon, which looks like it is offering discounted downloads for an annual subscription fee. Ed Sheeran's 'Make It Rain' track is £1.69 as a 16-bit/44.1kHz download, £2.56 in 24-bit/96kHz format or £1.16 with a Qobuz Sublime subscription. Discounts of 30 to 60% are available for Sublime subscribers. There's no Sublime subscription price information on the site yet, but keep checking. This could be a great way to save money if you buy a lot of high-quality music.

Tidal

Jay-Z's new music streaming service Tidal (tidal.com/gb) was launched recently at a big event in New York and was supported by top artists like Madonna, Beyonce, Kanye West and others. Technically, it was a take-over and relaunch, now with the backing of top people in the music industry. It aims to provide fairer payments for artists than other streaming music services, some of which artists have pulled their music from. (There are some notable artist exceptions on Spotify, for example.)

There are two levels of streaming music. First, there's a premium £9.99 a month subscription, which provides access to 25 million tracks at 320Kbps in AAC format (Apple's lossy MP3 equivalent).



▲ High-quality streaming from Tidal, but downloads elsewhere are even better

However, there's also a Hi-Fi streaming service that provides CD-quality 44.1kHz/16-bit streaming music for £19.99 a month. This is the same price as Qobuz's Hi-Fi streaming music service.

This is a new service, but it has the backing to become a great one. True audiophiles would not listen to CD-quality music, and higher-quality downloads are preferred, but the bandwidth required for anything better would be too great. CD-quality streaming is about the best you can expect at the moment.

Tidal works on desktop PCs, phones and tablets, and the website is excellent, comparing well with streaming rivals like Spotify, Deezer and others. The dark theme looks good, and you can browse a What's New section, Tidal Rising, explore all the music genres from classical to pop, create playlists and add tracks to favourites, listen to artist radio and so on. There are also 75,000 high-quality music videos to watch.

If you want streaming music rather than downloads and don't mind the CD-quality audio, Tidal is the best service on offer. The music sounds very good, but you do need the Hi-Fi subscription and not the regular one.

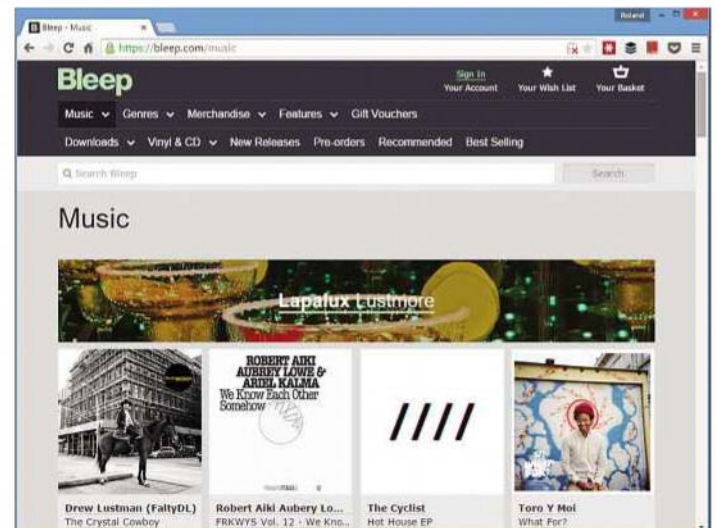
Others

Once you start searching for high-quality music downloads, you'll find lots of sources, but only the best ones have been featured here. There are many more, and some of them are worth exploring. For example, there's Bleep (bleep.com), which offers vinyl, CD, 320Kbps MP3, 16-bit lossless WAV and FLAC, and 24-bit WAV. Genres include bass, hip hop, electronic, house and disco, techno and so on.

iTrax (itrax.com) is interesting, and it provides downloads in a variety of formats, including up to 96kHz/24-bit. It also provides some music and videos in Dolby Digital and 5.1 surround sound. This is perfect if you want to make the most of a home theatre setup.

Linn Records (linnrecords.com) has a downloads section, and you can buy studio masters that are top-quality 192kHz/24-bit files. There are only a few hundred tracks, mostly classical and jazz. Bandcamp (bandcamp.com) features new music and directly supports the artists that produce it. Artists must upload in lossless file format, and the site converts it to whatever you want to download, including FLAC. Click a Buy button, and you're asked how much you want to pay, although sometimes the artist sets a minimum, such as \$2 for an album.

Also check out Pono (ponomusic.force.com), Juno Download (junoownload.com), MusicZeit (musiczeit.com) and Naim Label (naimlabel.com). mm



▲ There are high-quality downloads for every taste. Check out Bleep and similar sites



The Alternative ISP Guide

The consolidation of the UK Broadband market in the last six or seven years has left us with four major suppliers, and a dearth of choice, but there are alternatives out there...

The ISP market might be bigger business than ever, but if you're a consumer it often feels as though it's shrunk. During the days of dial-up it seemed like everyone used a different service provider, whereas now it seems to be one of a few big telecoms or media companies, many of whom aren't exactly famed for their low prices or good customer service.

So are there any better alternatives out there, or have the big companies hoovered up the competition's users with good reason? Let's try to find out.

The Big Four

Just to make the distinction clear, when we talk about the biggest Internet Service Providers in the country, we've got the following companies in mind, all of whom have more than 4 million subscribers on their books:

1. BT (incorporating PlusNet)

The biggest broadband provider in the UK, with an estimated 7.5 million subscribers at present.

Cheapest package: Broadband (17Mbps, 10GB usage limit) for £21.49 a month.

Most Expensive package: Unlimited BT Infinity (76Mbps, no usage limit) for £44 a month.

2. Sky Broadband

Covering the UK and Ireland, this is the second biggest ISP in the country with 5.5 million subscribers.

Cheapest package: Sky Broadband Unlimited (17Mbps, no usage limit) for £23.90 a month.

Most Expensive package: Sky Fibre Unlimited (38Mbps, 25GB usage limit) for £46.40 a month.

3. Virgin Media

Currently has 4.6 million users subscribing to packages that include broadband.

Cheapest package: Up to 50Mb (50Mbps, no usage limit) for £28.50 a month.

Most Expensive package: Up to 152Mb (152Mbps, no usage limit) for £41 a month.

4. TalkTalk

A combination of former brands (including AOL and Tiscali) that adds up to a total of 4.2 million users.

Cheapest package: Simply Broadband (17Mbps, no usage limit) for £21.70 a month.

Most Expensive package: Superfast Fibre (38Mbps, no usage limit) for £31.70 a month.

Just to make it clear how the Broadband market has changed: in 1998 there were a total of 19 companies serving the same proportion of Internet access as the combined 90% these companies now account for. Basically, any ISP not on that list counts as an 'alternative' – no matter how well-known or rich it might be. That doesn't mean there aren't other providers still out there, though.

EE

It's not uncommon for people to buy broadband subscriptions alongside a mobile phone as part of a package or offer. Formed by a merger of Orange and T-Mobile in 2010 (both of which were rebranded in 2012), EE is the largest mobile phone operator in the UK, and has managed to parlay that into something like 800,000 broadband subscribers. That makes it several times bigger than the next smallest competitor, but only around a fifth as big as TalkTalk. In that sense, EE is the UK's only mid-sized broadband company.

Although these figures probably include mobile broadband subscribers, EE does offer fibre optic home broadband packages with unlimited usage and a free 'Bright Box' router. Its packages also include a call plan and optional access to a TV service.



“ Are there alternatives out there, or have the big companies hoovered up the competition's users with good reason? ”

The minimum-priced package (phone & broadband) is a 12-month contract that includes a 17Mbps broadband connection with an £11 a month line rental (if you pay for the year upfront) and £2.50 monthly subscription (discounted from £9.95) for the first 12 months, making an effective total of £13.50 a month for the first year and £20.95 for all subsequent years. If you can't afford to pay upfront, line rental costs £15.75 a month, so add £4.75 to the monthly prices quoted.

The most expensive package is a fibre optic Broadband package with a phone line and access to EE TV. The broadband offers speeds of up to 76Mbps with the same line rental cost as the cheaper package (£11 a month upfront or £15.95 if paid monthly) but with a monthly subscription cost of £34.95 for a minimum 18 month contract. This makes the total monthly price £45.95 with upfront line rental, or £50.70 with monthly line rental.

Good: Free router, TV options, reasonable monthly cost
Bad: Still a relatively large company, complex pricing

Zen Internet

Formed in 1995, Zen Internet is one of the oldest UK-based ISPs and while it has a focus on the business market, it does offer broadband for home users as both ADSL and fibre-optic connections. The costs for its services are expensive, but Zen is effectively a premium business service being offered to home



users, hence the high cost. It is estimated that the company currently has something in the region of 80,000 subscribers.

Its cheapest package is 'Zen Lite', an ADSL broadband package which costs £18.37 a month on top of your monthly phone costs. For that, you get speeds up to 17Mbps and a 50GB data cap. Routers are available for £35.94. You can also transfer your phone line to the company, but there is no obligation to do so in order to receive their services.

The most expensive package is "Unlimited Fibre 2", which includes a fibre-optic line providing download speeds of up to 76Mbps in supported areas. The package includes a free router worth £60 and has an unlimited data usage cap. Monthly costs are £30 for the subscription and £16.99 a line rental, making a total of £46.99 a month, though it's worth noting that there's also a £30 activation fee for the first year.

Good: Business-level service & speeds

Bad: No free router, low data cap

Utility Warehouse

Formed in 2002, Utility Warehouse is operated as a separate brand by Telecom Plus and handles 500,000 customers (though



the number of broadband subscribers within that aggregate is unclear). While most ISPs tend to bundle access with entertainment services, Utility Warehouse bundles its broadband with – as the name suggests – utilities. Customers can buy broadband packages that include electricity and gas supplies as part of the monthly cost, as well as mobile phone services.

Their standard ADSL broadband package offers speeds up to 16Mbps with no minimum contract length, no connection fee, unlimited data and a free wireless router. The subscription cost for the package is just £8 on top of line rental, which claims to be the UK's lowest, at £15.30 a month. This makes the complete package cost £23.29.

The larger broadband package is called Ultra Broadband and includes fibre-optic speed speeds of up to 76Mbps with a free wireless router, 18 month contract for £19.99 plus line rental. The total cost is £35.29 a month, though there's also a £30 connection fee for this package.

Good: Low pricing, unique utility bundling strategy

Bad: Only two packages

Origin Broadband

Based in Doncaster, Origin operates its own network in South Yorkshire and is the UK's 11th largest network, offering ADSL and fibre-optic services. It also claims



to offer the UK's cheapest line rental, though this is only true if line rental is paid in an up-front lump sum, otherwise it's £16.40 a month.

Origin's cheapest package, simply named 'Origin Broadband', is 17Mbps ADSL which includes a free wireless router and unlimited data on a 12-month contract for £10 subscription, alongside your line rental. Paid monthly it costs £26.39 a

year, but if you pay for a year's line rental up front it costs an effective £19.16 a month, and if you pay two years up front it costs just £18.32 a month.

Origin's most expensive package is a fibre-optic 76Mbps package with all the same perks, but an 18-month contract and £23 a month subscription. Paid monthly, it costs £39.39 including line rental, with a year's up front line rental it costs an effective £32.16 a month, and with two years up front it costs just £31.32 – good savings, if you can afford to make them!

Note that on the former package, Origin's data requirement only applies to its main network, not on partners – though unfortunately there's no easy way to tell which you can access until you sign up. Luckily, the latter package has free download usage across all networks. A router costing £10 is added to both packages by default, but you can choose to have no router to save the money, or a more advanced one for £30 instead.

Good: Low prices if you can afford to pay in advance

Bad: Limited variety, weird availability constraints

KC

Operated by Kingston Communications, KC is an alternative 'triple play' provider offering the same package as the biggest providers – bundled phone, Internet and TV services.



Based in Hull and available in the surrounding areas, the company offers several broadband packages using its 'lightstream' fibre-optic network as well as traditional ADSL.

The cheapest package – simply called 'Home' – does not quote a download speed, but has a 35GB download limit, so it's safe to say it's probably around 17Mbps (which is standard ADSL speed). The monthly cost includes line rental and free evening & weekend phonecalls as well as 120 minutes free calls to mobile phones for a total of £32 a month.

“ While most ISPs bundle access with entertainment services, Utility Warehouse bundles its broadband with – as the name suggests – utilities ”

The most expensive package is called Lightstream Ultra 250 and offers a 250Mbps fibre-optic download speed, with monthly line rental and unlimited local calls, 180 minutes of free mobile calls and free directory enquiry calls included in the package. The Lightstream Ultra 250 package also has an enhanced upload speed of 15 Mbps and currently offers free connection (though at time of writing, the deal is due to end on May 1st 2015).

The total price is £69.99, so it's not cheap, but it does offer a standard of connection few other providers do.

Good: Offers high-speed packages

Bad: Local availability only

Claranet Soho

Founded as Claranet in 1996, the company has a presence in the UK, Germany, France, Spain and Portugal and has survived as an independent ISP even though many of its peers ended up consumed by larger brands. Although the company now focuses on managed hosting and services, they do still offer Internet connections through their consumer-oriented brand, Claranet SOHO. The SOHO acronym stands for Small Office/Home Office and, as the name suggests, is largely aimed at business users.

The site does not quote the prices of individual packages without full personal details, but standard ADSL is available from £17 a month (excluding VAT) with an installation fee of £10, so expect an effective minimum of £21 a month.



“ The acronym stands for Small Office/Home Office and, as the name suggests, is largely aimed at business users ”

Fibre-optic lines start at £36 a month (ex VAT) with a £150 installation fee on 12 month contracts (although it's waived for 24-month contracts, which they also offer). Their fastest package gives a 76Mbps download speed and a 19Mbps upload speed, with no data cap and a free Netgear router as part of the package, though you can imagine that package is far more expensive than the £36 minimum.

Good: Business-focussed services.

Bad: Probably too expensive for home users.

Demon Internet

Another survivor from the 90s, Demon Internet was founded in 1992 as one of the UK's earliest ISPs, and currently operates as a brand of Vodafone after it purchased Demon's previous parent company, Cable & Wireless

Worldwide. At present Demon only offers two broadband packages, both of which are ADSL-based and business-focussed. There's a 5% discount on pricing if you pay annually and a free router is included.

Demon Business Lite+ starts at £13 subscription (ex VAT) for a 24-month contract and offers a 19Mbps download speed with a 60GB usage allowance, unrestricted overnight usage and up to 16 static IP addresses.

The more expensive package, Demon Business Unlimited, offers the same speed and perks but with unrestricted download usage and costs £17 a month (ex VAT) for a 24 month contract.



Whatever Happened to Freeserve?

Before broadband took off, it was common for dial-up ISPs to charge a monthly subscription, while you paid the price for calls to phone provider. It didn't have to be that way, however.

Launched in 1998, Freeserve used a radically different model: it was subscription-free, and made money through a profit-sharing model that saw it take a cut of the call charges for its local-rate dial-up numbers. The idea was embraced by the public, and within two years it had amassed two million users, making it one of the UK's biggest ISPs.

Despite this, the company was losing huge amounts of money. It had yet to turn a profit when, in December 2000, it was bought by French telecoms company Wanadoo.

Unfortunately, Freeserve's model proved easy to replicate and a huge number of imitation ISPs were established. Most major ISPs also launched their own subscription-free dial-up services, while cable providers such as NTL World offered their customers a subscription-free ISP with significantly cheaper pricing than BT's local call rates.

In 2004, with Freeserve's popularity waning (not least because broadband was becoming more popular) the company was rebranded Wanadoo UK. In 2006 the parent company and its subsidiaries were all rebranded as Orange, and in 2012 rebranded again to their current name, EE. Dial-Up access has long since ceased to be a concern for most Internet users, though EE do still offer a dial-up connection. The freeserve.com domain no longer exists, and the most visible legacy of Freeserve is found only in EE's free webmail service, which still supports fmail ("Freeserve mail") addresses – though fmail itself was discontinued as a brand in 2012.



In both cases, line rental can be transferred to Demon (though it doesn't say how much they charge) or you can use your existing line.

Good: Static IP addresses and unmetered overnight downloads on metered packages

Bad: No fibre-optic package – relatively slow ADSL only

Although we can't look at every single alternative ISP in the country, we hope this gives you a look at what's out there beyond the options offered by the bigger providers. It's fair to say that, in terms of services and pricing, some of the smaller ISPs offer you something the big ones don't – especially if you're a business customer. So, next time you go looking for a new broadband provider, it could well be worth looking around to see what else you can find! [mm](#)

The Evolution Of Radio

How FM's Future Is Fading



Mark Oakley looks at how the digital switchover has begun

Norway is a beautiful country. We've not actually visited it, you understand, but we've seen pictures, watched videos and concluded that Norway is indeed a beautiful country. According to the Visit Norway website, it's famous for its fjords – with two featuring on the UNESCO World Heritage List. The weather is much milder than you might expect, trolls are an important part of its folklore, and it apparently has an indigenous blue parrot (at least according to *Monty Python*).

Another fact about Norway that will appear on the Visit Norway website for future generations is that it now has the claim of being the first country in the world to say “farvel” to FM radio. For those of you who don't speak Norwegian – really, shame on you – ‘farvel’ means ‘goodbye’. Which is to say that the Norwegian government has announced that it's to get rid of FM radio in less than two years. Yes: on January 2017, FM broadcasting in the country will be no more.

While Norway might be leading the way on this, radio's digital switchover is on the cards for UK listeners too. Television's digital switchover has been and gone, with the last remaining analogue

signals turned off in 2012. As for radio, the situation is a little muddier. The switchover will happen, but timescales are unclear.

Before we look at how quickly the UK might follow Norway's lead, though, it's probably best to look at how we got here in the first place. When did digital kill the analogue star?

Marconi, AM And FM

It is widely acknowledged that the father of what we know today as radio is Guglielmo Marconi. An Italian electrical engineer and inventor, Marconi expanded on the work of many a great scientist before him to come up with the idea of developing a commercial wireless communication system. Conjuring up images of the great Nikola Tesla and Michael Faraday, these were giddy times of invention and discovery and Marconi's British patent for a Hertzian wave-based wireless telegraphy system, given in the late 1890s, marked the beginnings of what would become commercially available radio sets.

To back up for a moment, a Hertzian wave is better known as an electromagnetic wave and is produced by oscillating electricity in some

EVOLUTION OF RADIO



Chief among the implications of this development was that it allowed for a wider range of frequencies, plus the eradication of the crackle and hiss of AM transmissions. Armstrong came up with a patent for wide-band FM in the 1930s, but the first FM transmissions didn't come to the UK until the BBC first adopted it in 1955. From there, hundreds of stations – AM and FM, local, national and commercial – were born. Radio stations that have long brought us the Top 40, sports broadcasts, endless music to cater for all tastes... and James Whale.

With radio sets so common in households and cars, modern listenership probably began to take radio broadcasts for granted. Until, that is, the world changed.

The Birth And Rise Of Digital Radio

It may surprise you to read that digital audio broadcasting (DAB) was actually developed as a standard in the 80s when a bunch of European scientists worked on the project at a German research centre. Digital transmissions work by digital receivers collecting compressed audio, throwing out interference that you get from radio waves that bounce off walls and other surroundings when doing so. This one signal remains the same, which means you don't have to retune like you do with FM, and the overall result is, in theory, a clear, quality signal that also contains metadata for the station, such as the song and artist currently playing.

“ It's perhaps fitting that Norway launched the first DAB channel in the mid 90s. The BBC followed suit soon after ”

Bringing things full circle, it's perhaps fitting that Norway launched very first DAB channel in the mid 90s. The BBC followed suit soon after, and throughout the last decade DAB receivers have become widely available the world over. The UK was something of a pioneer of DAB stations actually, something that has led to the current situation in this country where we have 198 stations broadcasting (according to Ofcom's Digital Radio Report 2014). Which is all well and good, but why does that mean digital or nothing? Who decided that analogue wasn't good enough?

You'll be glad to hear that you can blame the government. In its Digital Britain report in 2009, it was suggested that digital



form of conductor (apologies if reading *Micro Mart* now feels like being back in school). Discovered by German physicist Heinrich Rudolf Hertz, it is he who the 'Hertz' (Hz) unit is named after. Science class dismissed, back to history.

Marconi opened up a factory in England – Chelmsford, to be precise – and set about experimenting, successfully transmitting radio waves from the Isle of Wight to Cornwall in 1901. Obviously something of a big deal, this discovery led in time to the launch of radio station 2MT, the first British station to broadcast in early 1922. Months later, the BBC was formed in October 1922 and made its own first broadcast in November of that year thanks to its snapping up of 2LO, another Marconi-run station.

The BBC would go on to have its own long radio history, of course, but the next step for radio in more general terms was the invention of FM. For that, we have to look across the Atlantic Ocean as we have inventor and scientist Edwin Armstrong to thank for his work in inventing frequency modulation transmission, or FM to we mere mortals.



radio was the future and that national radio stations should work towards switching off from analogue transmissions altogether. Why? Well, there is more space on the DAB spectrum than on the FM one – which is pretty crowded, so goes the argument – so that means more choice of stations. Commercial radio stations have also expressed in the past that they are keen on the move to digital happening with a definite date set to it so that manufacturers of sets make the necessary arrangements and then those stations can concentrate on digital platforms only. The lack of a definitive decision probably isn't helping matters for them. As for radio manufacturers themselves, one can assume that they are only too happy for the public to spend money on upgrading to DAB.

When Will The Switchover Happen In The UK?

The full change to DAB could have happened as early as this year according to the first Digital Britain report. However, it stipulated that for the switchover to take place 50% of all radio listening had to be via digital radio. What's more, national DAB coverage had to be comparable to FM, and local DAB coverage had to be able to reach 90% of the UK population and all major roads. At present, according to Ofcom's Digital Radio Report 2014, only 36.3% of all radio listening hours in the year to June 2014 were via digital means. As for coverage, that too remains behind FM. BBC National coverage and commercial national coverage is broadly similar (or indeed better on digital) but the aggregate of local coverage in households is nearly 20% lower for digital listening than for FM listening.

On this basis, then, we shouldn't worry yet about the switchover happening any time soon, although comments from the Minister for Culture and the Digital Economy Ed Vaizey – "Digital radio is the future of radio in the UK" – reiterate the government's stance. It's also interesting to note that the government has changed the goalposts for its switchover target: while it was initially set at 50% of radio listeners using DAB, it's now 50% of all radio listening via digital – which now includes listening to digital audio via your computer, for example. A target of 2020 has been thrown around, but it all depends on the

“ It may interest you to hear that DAB isn't 'better' than FM in terms of audio quality ”

take-up of digital listening continuing in both the home, and the car. As for what will go in the switchover, national radio stations have been cited as the stations that would be turned off from FM, while some AM stations would be shifted over into the bandwidth space that they leave behind.

Is Digital Better?

The government's stance on digital radio seems to centre on the issue of choice: more stations means more choice, which in turns means happier audiences. However, it may interest you to hear that DAB radio isn't 'better' than FM in terms of audio quality. Some DAB transmissions suffer badly in terms of bandwidth: the BBC's national channels fare better than most at up to 128kbps – and even better for the likes of Radio 3 – but some channels broadcast at just 64Kbps. Compare that to the 256Kbps MP3 music you'll download from the likes of iTunes and Amazon MP3, or Spotify streaming content at 160kbps for free users and 320kbps for premium users, and it's obvious that IP radio and has an advantage. That doesn't fix the issue of how to get digital radio sets in the home or, more importantly, in the car.

One solution to this is DAB+, a new standard promising better quality audio as it's encoded in aacPlus as opposed to the MP2 that DAB is encoded in. That does come with a trickier upgrade path however, with DAB sets then becoming obsolete. It also doesn't necessarily translate to higher-quality transmissions longer term as the problem of finite bandwidth still exists.

So, is digital better? It's good, certainly. Test Match Special is far more enjoyable thanks to DAB than the old LW version. It's a stretch to suggest, though, that it's all-round better than FM as a radio solution.

In-car Uptake: The Elephant In The Room

According to Ofcom's Digital Radio Report 2014, over half of new cars (54.8%) are fitted with DAB radios as standard. This represents a 16.5% year-on-year increase in newly-registered cars utilising the technology.

As for digital coverage, FM remain the winner with an aggregate 91.5% of local coverage on roads compared with just 58.1% of local multiplexes serving DAB coverage on roads. Likewise, 84.2% BBC National coverage on roads is also a significant enough drop-off from the 93.1% coverage achieved for BBC National radio on FM.

Add to this the fact that there are some 560 AM/FM stations compared with 198 digital ones – the big differences being amongst community and local commercial stations – and it seems obvious that there remains an appetite, and even a need, for analogue radio. Fans of those stations would surely miss out in any digital switchover as not all stations would make the move to digital, or consequently the move from AM to FM.

Taking another look at that DAB in cars figures, the percentage of drivers using a vehicle with a digital radio – that is to say among drivers using a vehicle with a radio in it at least once per week – is just 27%. That's 6% higher than in 2013, but it's still a low proportion of overall radio use while on the road.

This, then, remains one of the key barriers for any digital switchover here in the UK. Yet it won't necessarily stop it from happening – just 20% of Norwegians have DAB in their cars, but the 80% of those who haven't are either going to have to pay for an upgrade or make do with CDs once FM has been ditched.



How Would A Switchover Affect The Industry?

If we were working in the radio manufacturing business, I'd obviously be urging the government to push the switchover through ASAP. Forcing people to upgrade means more money in my pockets as we would ship more radio sets. As we're not, we worry about the impact on small local, community stations that have steadily built up an analogue presence but not a digital one. Their listenership will obviously be severely reduced and eventually wiped out entirely as a steady move to digital will render the analogue signal obsolete over time.

The Digital Britain report suggested replacing the freed-up FM bandwidth with "a new tier of ultra local radio" which could provide a boost, in theory, but any switchover is going to see millions of listeners upgrading their radio sets and moving away from community radio if anything.

As for commercial stations, the idea of being forced to lose FM listenership and with it a valuable, active audience to advertise to could prove a disaster.

How Will It Affect You?

So to the nub of the matter. When the digital switchover does happen – and it will, even if it is happening later than the government might wish – what does that mean for us? That very much depends on how you listen to music and radio.

With services like Spotify, iTunes Match, Deezer and more, plus the steady take-up of Internet radio (with digital radio via broadband Internet taken up by 78% of households according to Ofcom's 2014 Digital Radio Report), there is a solid enough argument that the fall of analogue really wouldn't affect the majority too greatly. DAB coverage is noted in the report as being well over 90%, rising to 99% for radio services via digital televisions, and with 198 radio stations broadcasting on DAB, the choice is greater than ever before.

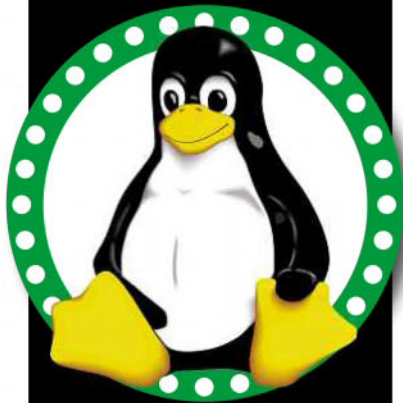
This choice, though, has come at a cost: quality. The quality of broadcasts is, unless you're listening via an Internet Radio platform, typically inferior to FM transmissions. So when the switchover happens and national radio stations cease FM transmissions, we all lose out on the quality of the broadcast.

The cost of upgrading to digital radio in the home isn't all that much of an issue – you can pick up a basic DAB set for under £20. The cost of upgrading to a DAB+ radio is slightly more, although again it isn't ridiculous – you can find some for less than £40. It is annoying, though, to have to spend money on yet another digital radio just because the one you currently have is based on a technology that just wasn't ever going to be fit for purpose once the full gamut of stations threw their hats into the ring. The matter of the millions of DAB radios sold to the public without any upgrade potential is a very real one that the industry would be questioned about should that switchover happen.

And what of digital radio on the move? With in-car coverage still far below FM's and portable DAB radios not being a patch on their static cousins, the idea of having to upgrade your car to accommodate digital radio is a far more expensive one. Hundreds of pounds would have to be spent and that will stick in the throat of drivers who are perfectly happy with FM transmissions.

We're all for progress and are fully signed-up users of digital radio stations, podcasts and digital music. It just seems that the switch from FM to digital seems to be solving a problem that doesn't exist. If digital radio transmissions can improve the listening experience and be delivered to the vast majority of the population for little cost, then I'm on board.

As it currently stands, though, we'd rather stick with things as they are. We want choice. We deserve choice, but there is nothing wrong with FM radios, radios that cost people a lot of money to buy in the first place. DAB can run alongside FM; they can coexist. It doesn't have to be an either/or decision. **mm**



David Hayward has been using Linux since Red Hat 2.0 in schools, businesses and at home, which either makes him very knowledgeable or a glutton for extreme punishment

LINUK

New Distros

A handful of new distros to check out this week

There have been a few new distro entries these last couple of weeks, each with its own particular theme or design, or standing out from the crowd by offering something a little different from the norm. Either way, there are some interesting picks to look into.

4MLinux 12.0

4MLinux is a small, built-from-scratch distro, and it features out-of-the-box tools and programs for system rescue, watching videos, listening to music, playing games and deploying servers.

The 4M part of the name stands for Maintenance (system rescue), Multimedia, Miniserver (using inetd daemon) and Mystery (being the collection of Linux games).

In this newly released .iso you'll find an improved core, GNU C library 2.21, PAE support, Chrome, a few extra games (FreeDoom and Abuse) and enhancements to the stability and speed of the system.

It's an interesting distro and one that can be tweaked to be quite an effective image to boot from. Check it out at goo.gl/HfbOmr.

OpenELEC 6.0

For those who use their Linux PCs as media centres, there's a new beta release of the popular OpenELEC available to test.

The new beta features an updated audio encoder and video decoder, the latest FFmpeg codecs, Linux kernel 4.0, and system and graphics drivers.

Version 6.0 beta is available for a number of devices, including the Raspberry Pi and RPi2 ARMv7 builds, even Freescale iMX6 CPUs. But regardless, there's plenty to take into considerations here and of course to test and feed back to the developers.

If you're interested, then visit goo.gl/nGgoKL and select the OpenELEC 5.95 release series for OpenELEC 6.0.

Tiny Core 6.2

Tiny Core Linux 6.2 has now been released, unbelievably as an image that's only 10MB (yes, ten megabytes) in size, but one that still manages to pack in enough modules to make for an excellent and personalised distro.

The Core package is the one that's 10MB, with Tiny Core coming in at 15MB and the third version of the TC trio, Core Plus, with an .iso size of 77MB.

Whichever one you choose, Tiny Core is a blisteringly fast and stable Linux build to tinker with. The recent changes to 6.2 are too numerous to list here, but suffice to say, there's plenty to appreciate and get your teeth into.

You can download any or all of the Tiny Core disc images at goo.gl/pD8naj (with the 64-bit versions, Core Pure64 and Tiny Core Pure64, available at goo.gl/Xpz9mJ).

Tails 1.4 RC1

Tails, The Amnesic Incognito Live System, designed to keep you safely anonymous while on the internet, has announced the latest release candidate for version 1.4.

In this new version you'll find some major updates to the Tor Browser, security patches, vulnerability fixes and some bug fixes. There's also been a number of minor fixes from the last version, as well as some enhancements and improvements to overall system speed and stability.

However, as the developer indicates on the Tails site, this is a test image, so there's a good chance you'll come across something that could break it. If that kind of thing is your cup of tea, however, then pay a visit to goo.gl/X4OJ4H, download or upgrade to version 1.4RC and test away. Don't forget to report back your findings to the developer, though.

Plenty More

These are just four examples of what's now available to download from the many servers across the world. Needless to say, there are plenty more new distros, versions, betas and upgrades to consider.

If you come across any that deserve a mention, then please get in touch and let us and other readers know.

▼ *Version 12.0 of 4MLinux is now available, and it looks great*



From Bedrooms To Billions Special Edition

Sven Harvey takes a look at the documentary film

Funded by a Kickstarter campaign in 2013, *From Bedrooms to Billions* is a documentary film charting (primarily) the founding of the computer game industry here in the United Kingdom and showing how it led the world, prior to the switch to it being a videogames industry instead.

The documentary is mainly made up of talking head footage made up of excerpts from interviews with some of the pioneers of the British industry, conducted especially for the film. The interview snippets are constructed together into time frame segments (for instance all the parts of the conversations about the Sinclair ZX Spectrum are together) and intermixed with some vintage footage, advert scans and even newspaper clippings.

Most of the detailed exploration of the creation of our industry is during the 1980s, from the ZX-80 on to the Commodore 64, with a brief section on the Amiga and ST. It then goes on to explain how the move to the consoles, as Commodore and Atari floundered, divided and conquered the British games development community, because everyone was compelled to pick a side between Sega and Nintendo, before Sony swooped in and took the likes of Psygnosis and Millennium under their wing, while Ocean and Gremlin were merged into Infogrames.

Anthony and Nicola Caulfield are to be congratulated on having the bravery to get this project done, and I must say I didn't expect the film to be quite as engrossing as it is. I don't think I have come across any short or feature length film that is mostly just interview segments that has grabbed my attention quite so well. Admittedly I

have a keen interest in British computer and videogaming, but the interview snippets have been woven into a great narrative depicting the industry development, and I simply didn't want to stop watching, even though from the point of view of an Amiga fan (more than prior home computers), I was slightly disappointed. The presentation of the disc and menus is as you may expect from any main video label.

This 'Special Edition' version includes a second disc with extended interview footage presented just in interview form including, of main interest to Amigans, Peter Molyneux on creating *Populous*, Martin Edmondson on creating *Shadow Of The Beast*, Mike Montgomery on creating *Speedball II* and Jon Hare on creating *Wizball* and *Sensible Soccer*.

As with the majority of the film itself, these bonus interviews are high-quality recordings and are a fantastic insight into some of the most important game developments. The price may be a little high for some, but for a film with a small pressing run, it isn't actually that bad, especially when you realise some mainstream films on Blu-ray actually retail at £25.

Though perhaps a little lighter on the Amiga content as I would personally have liked, this is about the genesis of the UK development scene and industry. Also, a further film, *From Bedrooms to*



Billions: The Amiga Years has been successfully funded on Kickstarter and is on its way. I would also love to see things come full circle with a more direct follow-up, perhaps called 'From Billions To Bedrooms', charting the resurgence in smaller development teams and one-man outfit, which are once again developing British content for iOS, Android, PC, Xbox One, PlayStation 4 and PlayStation Vita.

If you have any interest in the British computer and videogame market, you'd probably enjoy this thoroughly, and I highly recommend it!

Recursion 2015

Following on from the successful event last year, another Recursion computing and computer science fair is taking place on Saturday 4th July. The event takes place in the Levi Fox Hall at King Edward VI School in Stratford-upon-Avon and will feature some Amiga dedicated space, especially with it being the 30th anniversary this year.

Find out more at www.recursioncomputerfair.co.uk.



Sven Harvey has been our Amiga specialist for over 15 years drawing on his 24 years retailing computer and video games (25 Christmases, no less) and even longer writing about them.

Amiga



Ian McGurran is a professional IT analyst, a semi-professional writer and a pretty amateur electronic musician. He likes gadgetry and loves making gadgets do things they were never designed to do

Mobile

Fine And Handy

Ian McGurran looks at the Double Fine legacy

Lefffield game developer Double Fine has a legacy that contains so many notable titles, stretching all the way back to its days as LucasArts, that there's an argument to say the developer, and especially its founder, Tim Schafer (with Ron Gilbert), is responsible for the foundation of the modern graphical adventure. If you're a computer gamer of a certain age, there's every chance that classics such as *Day of the Tentacle*, *Full Throttle* and the legendary *Monkey Island* series evoke fond memories of pointing, clicking and piracy.

Schafer formed Double Fine in 2000 to great anticipation, players eager to see what the 2D adventure master could do with the dawn of 3D graphics. The answer was carry on in the same slightly odd way. First was the misunderstood and under appreciated *Psychonauts* (an everyday story of a boy with psychic abilities fighting baddies in his friends' heads), then the misunderstood and under-appreciated *Brütal Legend* – the most 'm/ metal game you can play. The press loved them, gamers not so much. From this lack of success came the idea for smaller, indie-type games, such as *The Cave* (with Ron Gilbert) and the clever *Stacking*. Then, Double Fine turned to crowdfunding for *Broken Age*, a throwback point-and-click adventure. Given it was funded to over \$3 million in under a month, it's fair to say *Broken Age* has been hotly anticipated, and now it's on mobile.

First thing to note is *Broken Age* was episodic (for financial reasons), but part two has been released free of charge to mobile platforms for owners of part one. Of the game itself, well, it looks gorgeous with beautiful hand-drawn art. The game is

also superbly voice acted, with some big names such as Elijah Wood and Wil Wheaton. Some have taken issue with the puzzle difficulty (or lack thereof), especially those expecting a 90s head-scratchathon, but the jump to mobile appears to be without problems. For £7.99, you get a professional, beautiful game, which makes a nice change from endless runners and IAP-ridden turn-based strategy games.

Another of Schafer's Lucasarts classics, *Grim Fandango*, has also been remastered and made its way to modern hardware, including mobile platforms. Often cited as the last great, original LucasArts adventure,

you're looking at the same game, just upscaled. There's no huge texture overhaul, though given the art style for the 3D models didn't require intricacy, that's understandable. The lighting has been given a new engine and is much more realistic, but some backdrops haven't really benefited much from the upgrade.

Looks aside, though, it's still *Grim Fandango*, and it's all still here. The atmosphere is great, the story is excellent and all that made the game what it was in the past is still much in evidence. Bottom line: it's *Grim Fandango*, it's excellent, and it's on your tablet. What's not to like?

“ Grim Fandango's availability fell away with time ”

Grim Fandango is a game with the kind of story you have to read twice to make sure what you read was indeed what you read. It's an art deco *Casablanca*-style noir set in the Mexican / Aztec afterlife, involving a travel agent and a giant cuddly demon driver called Glottis. Safe to say, there's not been anything like it before or since.

As is the way with older games on older operating systems, *Grim Fandango*'s availability fell away with time, and it began to be spoken of in hallowed terms. However, with the current trend for HD revivals, *Grim Fandango* has finally found itself back in the limelight in 2015.

How does it hold up? Well, it's a HD remaster, but don't expect a whole new experience. For the most part

It's great to see two major adventure releases not only come to mobile platforms, but be a very good fit too. It seems games like these and those from Telltale Games demonstrate that 'point and click' may well soon be more 'point and touch', and a genre that fell from favour may be finding itself flourishing on a new, modern platform.



Pipedreams And Personal Clouds



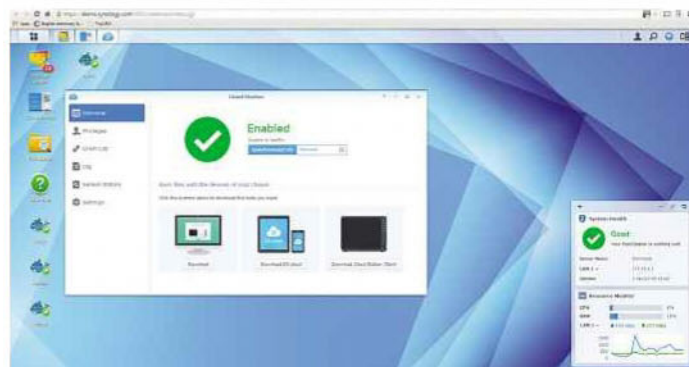
Andrew Unsworth gets hot under the collar thanks to AMD GPU rumours, and reports on an update to Synology's DSM

It's a common dilemma. Do you buy the latest state-of-the-art graphics card so you can play the latest games at their highest quality, or do you buy a cheaper, less able card so you can afford to buy games to play? If you're the kind of person that loves hardware and can live with playing last decade's games at warp speed, then you better find a yourself a bib, because you might be about to start drooling.

The internet is awash with rumours about the AMD Radeon R9 390X, AMD's answer to Nvidia's recent crop of second-generation Maxwell cards. It's rumoured to be watercooled like the R9 295X2 and to play the latest games at high settings in Ultra HD without breaking a sweat. Possible release dates are also just rumours at the time of writing, but I'm sure MM will bring you verified news on the R9 390X as soon as we have it.

Network-Attached Shiny

There really isn't much you can do in terms of design with a box that hosts hard disks, but Synology's boxes are always tasteful and look inconspicuous in a living room or study. Synology isn't alone in making good-quality boxes that store data, though. Qnap and Thecus are just two heavyweight NAS manufacturers who make good units, along with more commonly known brands



“ The internet is awash with rumours about the AMD Radeon R9 390X ”

such as Netgear and Western Digital. However, where Synology excels is with the software that controls its NAS devices, which is called DiskStation Manager (DSM). Synology has just released version 5.2 to the public, and if you use your Synology NAS device as private cloud storage, then you'll be more than happy with this update.

Derren Lu, Synology's CEO, says DSM 5.2 "empowers home and professional users with new tools and technologies to solve their everyday needs and improve productivity". For home users, perhaps the most important new tools affect Cloud Station, an app within DSM that lets you create and manage your own cloud storage service. Like many commercial cloud storage

services, Cloud Station records many different versions of a file. The new update lets you choose the maximum number of file versions Cloud Station will maintain, helping to keep your personal cloud clutter-free or super safe, depending on your nature. The new update also lets your NAS synchronise files with a public cloud service more easily, with the option to encrypt files before they're uploaded to a public service.

If you haven't experienced DSM yet, head over to the Synology website, where you can try out a live mock-up. You can see how DSM works from the initial login screen to installing Synology and third-party apps, such as a Plex media server, and managing hard disks, among many other things.

Andrew Unsworth has been writing about technology for several years, he's handy with a spanner, and his handshaking skills are second to none

Hardware



Ryan Lambie has loved videogames since he first stared up in awe at a *Galaxian* arcade cabinet in his local chip shop. 28 years on, Ryan writes about gaming for Micro Mart. He's still addicted to chips and still useless at *Galaxian*

Apocalypse Now

Are you the only person left on Earth after the events of The Bible's Book of Revelation? That's the question posed by forthcoming "parkour and puzzles" game, *Downward*

This week, Ryan checks out *Downward*, a post-apocalyptic sandbox game with a difference, and takes a look at the latest news on *Star Wars: Battlefront*...

Plug & Play

End-of-the-world scenarios are a common enough sight in games, from the zombie-infested landscapes of *DayZ* or *H1Z1* to the post-nuclear dustbowl of the *Fallout* series. The forthcoming indie game *Downward*, meanwhile, is set to offer a very different take on the kind of post-apocalyptic settings we're used to seeing in our favourite medium.

Downward imagines what the world might have looked like if the events of the book of Revelation took place back in the middle ages; towns, cities and cathedrals lie abandoned, and you are, it seems the only person left to roam this lonely environment. The debut title from Italian developer Caracal Games, *Downward* is described as an FPP – a first-person parkour game, which seems to place it in the same sparsely-populated genre as *Mirror's Edge* and *Dying Light*. Unlike those games, however, *Downward* looks set to offer a less frantic experience – here, there are no zombies or armed guards to force you forward or climb for safety. Instead, it seems as though the landscape itself is simply a big, free-roaming puzzle – not unlike Croteam's brilliantly minimalist brain-teaser *The Talos Principle*, perhaps.

Caracal describes such games as *Prince Of Persia*, *Silent Hill*, *Another World* and *Shadow Of The Colossus* as influences, and there's certainly a hint of that latter game in the lonely vistas presented in the game's first screenshots, which you can see dotted around these pages. If, like us, you're quietly impressed by the exotic old buildings on display, there's a good reason why *Downward*'s abandoned structures look so convincing: its lead designer has a degree in archaeology.

While the world Caracal's creating is already looking concrete, player objectives are a little more nebulous. The team describe the central character as a wanderer with a thirst for knowledge, and the central goal seems to be to collect a series of artefacts that explain how and why the rest of humanity has vanished.

Downward doesn't sound dissimilar from British indie developer The Chinese Room's first-person adventure game *Everybody's Gone To The Rapture*, its follow-up to the acclaimed *Dear Esther*. Like *Downward*, The Chinese Room's game sees the player exploring a worryingly quiet landscape in search for clues to the former inhabitants'

whereabouts. The parkour element should, however, make *Downward* a very different proposition to The Chinese Room's more stately brand of game design, and Caracal have alluded to one or two additional play elements that are still being worked on – the player will have some sort of mount to ride around on, and the team's currently working on "secondary activities" to run alongside the 'parkour and puzzles' gameplay.

While it's early days for *Downward*, the presentation and concept behind it already has us intrigued. The game's currently scheduled for release next winter, so we'll be sure to see lots more from Caracal's work-in-progress over the next few months. You can find out more with a visit to www.downwardgame.com.

Online

In what promises to be a banner year for *Star Wars* fans, EA Dice has gradually been peeling back the covers on *Star Wars: Battlefront*, the multiplayer shooter scheduled to arrive just before *The Force Awakens* appears on the silver screen. Dice's reveal of *Battlefront* has been coy, to say the least, with the opening salvo of trailers and screenshots keen to showcase



▲ The previously-unseen planet Sullust will be one of the primary locations in *Star Wars: Battlefront*. It's a volcanic place where the Empire has set up a base of operations

the game's (admittedly sharp-looking) recreations of the film series' characters, weapons and locations, but revealing virtually nothing of the game itself.

Some of the announced features have also received a mixed response from fans of the earlier *Battlefront* titles. The lack of a single-player campaign received a murmur of discontent, but the game's lack of space battles sparked a louder sigh of disappointment. Instead, *Battlefront's* action will take place exclusively on or just above the surface of a string of planets, including such familiar locations as Endor, Tatooine and Hoth.

All told, there will be 12 multiplayer maps spread across four planets, and EA Dice says up to 40 players will be able to fight at once, with maps designed to

accommodate close-quarters infantry skirmishes or broader vehicular battles. One of those battles is called 'Walker Assault', which, Dice recently took to Twitter to confirm, will include the AT-ST (fondly dubbed the Chicken Walker) as a playable vehicle. It would also seem logical that its larger cousin, the AT-AT, will be available to pilot, too.

EA has also provided an early look at *Battlefront's* fourth, previously unseen planet – Sullust, the home of diminutive Rebel hero, Nien Numb. A volcanic planet of grey rock and dramatic geysers of crimson lava, Sullust's terrain is closely modelled on Iceland (the country, not the chain of food stores). It is also, EA has revealed, an Empire stronghold, with its surface home to a huge

base modelled on the jagged architecture of the Death Star.

Dice's commitment to the minutiae of *Star Wars* lore aside, the studio's also been working to head off suggestions that *Battlefront* is a *Battlefield* engine with added Stormtroopers. One of its recent announcements concerned the way players will aim; in an interview with *Official Xbox Magazine*, executive producer Patrick Bach revealed that iron sights won't feature in *Battlefront* – though some rifles, he said, will have scopes. The decision, Bach seems to suggest, is to avoid comparisons with its other shooters.

"A lot of the things you saw in the game have nothing to do with anything we've done before," Bach said. "Some features of course resemble [our other shooters], because we want to make the best possible shooter, but in general we've tried to do something completely unique."

How unique, exactly? We won't know the answer to that until we're given at least a glimpse of the game in action. With only months to go before *Star Wars: Battlefront's* November release, that first glimpse surely can't be too far away.

Incoming

After years of silence, rumours and uncertainty, EA formally confirmed the existence of *Mirror's Edge 2*, the sequel to Dice's flawed yet fascinating 2008 parkour game. Even as it's throwing its efforts into getting *Star Wars: Battlefront* ready, a series of dates published in EA's financial reports revealed that Dice is also at work on this sequel – scheduled for release in the first quarter of next year.

Reviews of the original were mixed, but most agreed that, when the level design meshed with the free-running mechanics, *Mirror's Edge* provided an unmatched sense of exhilaration. If EA Dice can recapture that sensation while avoiding the first game's tedious indoor moments, then *Mirror's Edge 2* could be a truly great sequel.



▲ EA Dice is clearly working away on its *Mirror's Edge* sequel at the same time as *Battlefront*. The parkour action game is scheduled for the first quarter of 2016

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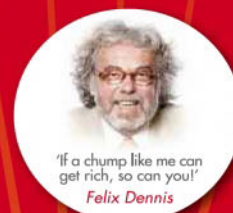
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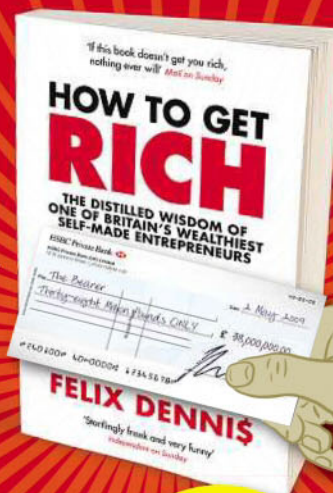
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Dell Inspiron 660 Intel i5 QUAD CORE with ACER 23 Inch LED monitor. AS NEW. Operating System: Windows 8.1. MPN:620MT. Memory (RAM): 4 GB. Hard Drive: 1TB. Processor Type: Intel Core i5. Primary Drive: Optical DVD+/-RW, Processor Speed: 3.0 GHz, Features: Graphics Card GT620 1GB. Acer LED monitor 23" HD. £520
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Email: a2345@btinternet.com

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Email: davethomas96@aol.com

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Tel: Gordon (01314) 660205
E-mail: scobie09@gmail.com

HARDWARE WANTED

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WANTED: Fractal Design Define XL full tower case. R1 (original version) in black.

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Email: mm@tectron.co.uk

WANTED: Working Dot Matrix Printer in Good Condition. Thanks!

Email: printer.20.odaily@spangourmet.com

WANTED: Acorn computer either an A5000 or A7000. Also book on teaching yourself binary.

Tel: (07817) 861011

Email: Johnhaviand73@gmail.com

WANTED: Corsair PSU cable bag. Please email me if you can.

Email: Paul@planetvoodoo.co.uk

Wanted: HD 3850 Graphics card, must be AGP. Tel: (07817) 861011

Wanted: Fully working mainboard for AMD socket AM2+/AM3, micro ATX size. Must use DDR2 RAM.

Tel: Brian Taylor (07570) 452557

Email: bmorgant@yahoo.co.uk

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Email: davethomas96@aol.com

Microsoft Office Small Business Edition 2003 with Business Contacts. Legitimate Office Small Office Business Edition comprising Word, Excel, Powerpoint, etc. Comes with small piece of OEM hardware and original license code (coa) £10 incl. delivery, cheque or PO. £10.50 by Paypal.

Tel: (07794) 528857 Email: it_central@ntlworld.com

Norton Utilities 16 for 3 PCs. Runs under Windows 8, 7, Vista or XP, Original Symantec CD with unused product key £12.50

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SOFTWARE WANTED

Wanted: LG GSA 2164 D software disc to replace broken original.

Tel: Glen Fremantle (01387)248976

Email: bldamsys@yahoo.co.uk

Wanted: Windows 98 CD ROM operating system with boot disk, instruction manual and serial number. Tel: Craig (07867) 930265 or 01912093677

Email: craigtin44@hotmail.com

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- Be wary of anyone who insists on you paying by the above methods if in doubt, get us to check them out by mailing editorial@micromart.co.uk
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ASK AARON



Meet Aaron Birch. He's here to help you with any general upgrading, software and system building problems. He's got advice aplenty, and you're very much welcome to it!

Send your questions to:
Aaron Birch
Micro Mart
Dennis Publishing
30 Cleveland Street
London
W1T 4JD

Contact Aaron by email at:
aaron@micromart.co.uk

Please try to keep your queries brief and limit them to just one question per letter, simply so we can squeeze in as many as we can each week. Please include relevant technical information too.

Aaron

McAfee Be Gone!

I've got a PC that came with a trial version of McAfee anti-virus. Without my knowledge, my son used the PC and accepted the option to give the trial a go, and the software was installed. I never wanted to use McAfee, as I've never liked it, and would prefer to use Bitdefender or Bullguard as my anti-virus option.

I tried to uninstall McAfee, and I thought it was totally removed from the system, but when I try to install other AV programs, I get all sorts of problems, and I think I see various error messages that have something to do with McAfee files or system entries. I'm not sure what to do and how I can get my PC protected as I want it. Can you help me?

Bob

McAfee can be a very tricky security tool to remove at times, and some users would always advise you steer well clear of any trials because of this. However, as you're past this point, you'll need some help removing it. Luckily, there's always help available, sometimes from sources you'd least expect.

This time the help comes from McAfee itself, in the form of a specialised removal tool. This can be downloaded from McAfee's website, and once you have it, you can run the tool to properly remove all traces of the security suite from your PC. Once this is done, you should then be able to install whichever security

“ This time, the help comes from McAfee itself ”

software you wish to use, without any more issues relating to rogue McAfee files. You can get this tool from bit.ly/1gc6dTm.

▼ *Having problems removing McAfee software? Try McAfee's useful removal tool*

McAfee

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McAfee Active Protection technology provides the highest detection rates against threats.

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Removing product MPFP

Underpowered Purchase

I've bought a new PC, which I got from PC World. I went in with a good idea of what I wanted in terms of usage, but as I'm not versed on the technical details, I was relying on the shop salesperson to help me make a good choice.

I'm not entirely sure that this was a good idea, as I was sold a small system, which the salesperson assured me would be well suited for my needs. I'm not a heavy PC user, by any means, but I do spend a lot of time online, I stream a lot of videos via rental services and YouTube, and I also use my PC as a music and movie player.

I gave all of this information to the salesperson, and I was advised to go for what he called a small-form-factor PC. He said that this wasn't the most powerful option, but was better for my needs, and the size of the system would also be a benefit, as he didn't think I'd need to worry too much about upgrading.

The PC I got was a small, cube-shaped model that apparently contains a Core i5 CPU and 2GB of RAM. It has a Blu-ray drive, and a 1TB hard disk. I'm not sure about the graphics card; he wasn't as forthcoming about that.

I thought this was a good option, and he seemed to know what he was talking about, so I went for it. It looked like a good deal too. When I got it home and used it for a couple of weeks, I was more than a little disappointed.

The PC itself always seem to run quite slowly, nowhere near as fast as a friend's system I'd used that he recently bought, and as time went by, the system seemed to get slower. It struggles to play some video, and the overall speed just seems to be slower than it should be, especially for a PC that's pretty new.

Is there something wrong with the PC I've bought, or is the PC performing as it should, and have I simply been taken for a fool by the salesperson? I'd appreciate your input.

Adam

Extra Secure

RE: your recent 'Avoid The Scam' letter from James. This was a great reply full of first class advise for the unaware. Can I just add a little titbit regarding calling back the supposed help desk?

Try not to use your landline to return the call; use a mobile if you can. It's not uncommon for the scam caller to stay on the line when you hang up. They then apply a fake dial tone, so you think you're dialling a valid number but instead you're still connected to the original caller. If the mobile option isn't viable, simply make the call a few hours later; they aren't going keep your line open for too long, as there are other, less vigilant people to find.

Neil

That's very good advice and is something people should keep in mind if they suspect they're the target of a possible scammer. This kind of tactic may be rare, but it does happen, and there are many other tricks scammers will use to try to hoodwink you. Thanks for the additional information, Neil.

By the sound of it, Adam, I suspect the system you have is simply not powerful enough for your uses, and it sounds like a purposely designed low-power system. These kinds of systems can be perfect for some users, just like netbooks and other cheaper but less powerful models. Theoretically, they can handle the kinds of task you ask of them, but as you've found out, these low-end systems often end up being less than perfect.

“ Sales staff in many PC stores do get commission for sales ”

Sales staff in many PC stores do get commission for sales, and so there's always some pressure to close a deal, but I don't think you've been lied to or taken for the fool, as you say. I suspect the PC you've been recommended can, on paper, handle things, but in practice it's just not up to the task.

The specifications you've given are a little low, especially the RAM. I'd usually recommend at least 4GB these days, even for casual use. The Core i5 should be okay, although I'm not sure of the speed or model. Your storage is decent, and as this is a small-form-factor system, I'm fairly certain you're using on-board video. This being the case, some of your 2GB of RAM will be used for this, further taking away from the overall memory availability.

Boosting the RAM by another 2GB should help matters, although you could also be well within your rights to go back to the store and explain the situation, as the system doesn't do what you need. You may be able to come up with a solution or at least an upgrade. It's always worth asking.

▼ *Low-power SFF systems can be useful, but they're often underpowered for many users*



ASK JASON



Meet Jason D'Allison, a veteran of Micro Mart's panel of experts. He's here to help with any technical questions, including anything to do with tablets or smartphones, as well as PCs

Send your questions to:
Jason D'Allison
Micro Mart
Dennis Publishing
30 Cleveland Street
London
W1T 4JD

Contact Jason by email at:
jason@micromart.co.uk

While we try to cover as many questions as we can, we regret that Jason cannot answer your questions personally, but he'll cover as many as he possibly can each week. Please ask one question per letter and remember to include the full specification of your computer, including its operating system.

Jason

Hot And Cold

I have an elderly Shuttle mini-PC. The details are as follows.

CPU: 3.2GHz Pentium D
RAM: 2GB DDR2
GPU: GeForce 8500 GT (PCIe)
HDD: 250GB (SATA)
PSU: 400W
OS: Linux Mint 17

It's developed a strange switching-on behaviour. Once it's up and running, it works fine, but after switching it off it usually won't start up again until the next day. This is the case even if I remove the power cable, ensuring the PC is absolutely powered off. I can't see any reason for this and would appreciate your suggestions. Could the PSU be suspect, do you think?

George Pearson, BT

The PSU is an outside chance, certainly, George. However, as with 90% of hardware problems, my money's on the motherboard. I suspect there's a break in a circuit somewhere – most likely a failing solder joint or a cracked copper track. Basically, the board is only springing to life when it's 'warm'. With heat, metal expands, so the break in the circuit disappears. This is why the PC stays on once it's working.

The problem only occurs when the PC's 'cold' – the break in the circuit's still there. You may find that jabbing the power button repeatedly will warm the system up or else you'll just get lucky. I don't think there's any sort of timing at play that means you have to wait 24 hours after every shutdown.

Now, if I don't mention this I know someone will write in (not that I mind, of course), so here goes: could the CMOS battery be flat? In my view, giving the motherboard a new battery won't make a jot of difference – it's there just to keep the real-time clock ticking and to hold any BIOS changes you make. It's not a 'starter motor' – it plays no role in the boot process. You can remove it completely – normally, anyway. But, hey, a new battery can be bought with the fluff from your pockets, so it's worth a shot.

Also, try another PSU. I know the one in your Shuttle will be a custom shape, but all the cables and plugs will be standard. Set up any standard PSU on a desk or table, outside the case, and see if it helps. If it doesn't, you're back to the motherboard, and of course that'll be a custom shape, too. You'll need an exact replacement – no off-the-shelf board will fit. I'm not sure what Shuttle model we're talking about, but bear in mind you could run into trouble even with a board from a Shuttle that's a close relative. The I/O area could be positioned differently (I've come a cropper in that regard myself).

Armed with the correct model number, you may be able to chase down a correct replacement board from eBay or even a full chassis or complete system (from which you can rob parts). With technology of this vintage – a Pentium D system must be at least a decade old – I doubt you'll need to smash open the piggy bank. Sadly, it also means any replacement could have issues of its own. It may be time to think about putting the Shuttle into retirement, George.

▼ **If the motherboard fails in a Shuttle, good luck in finding a replacement**



In A Bad Mode

One of my presents at Christmas was a Hudl tablet. I use it a lot for catching up on the soaps and stuff, so I've bought an HDMI cable to enable me to watch them on my TV. But nothing happens – there's no signal. The cable was cheap, so I thought maybe it wasn't any good, but just now I've connected the Hudl to a friend's TV and everything works a treat. Back at home, nothing. Help!

Vic, TalkTalk

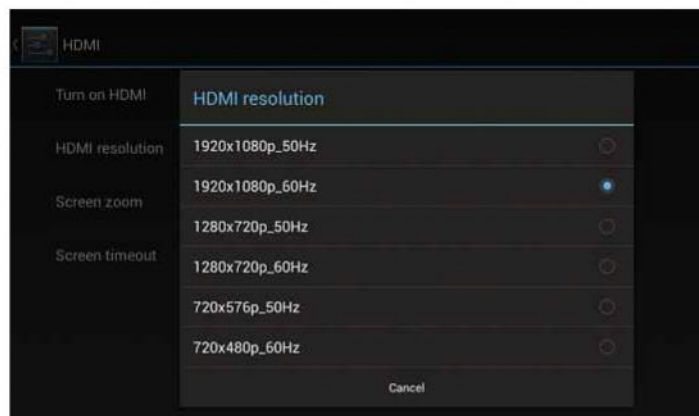
I'm certain this is happening because the tablet's HDMI output is set to the wrong mode. I don't know whether we're talking about the Hudl or the Hudl 2, but I think in both cases the default mode is 1080p (1920 x 1080) at either 50Hz or 60Hz.. My guess is that your friend's TV supports this default but yours doesn't. Perhaps your TV tops out at 720p (1280 x 720).

What you need to do, Vic, is enter Android's settings – drag down your finger from the top-right of the screen and touch the cog icon. From the menu, select HDMI, and then select Modes. Make sure the HDMI cable's plugged in at both ends when you do this, else the Modes option will be greyed out. Try the 50Hz and 60Hz 720p outputs first and take things from there if you don't hit the jackpot.

The odd thing about HDMI on the Hudl – and with the other Android devices I've used HDMI on (not many, admittedly) – is that the output

mode resets at the drop of a hat. You'd expect your selection to stay put until you changed it, but the default kicks in the next time you plug in the cable or even if the device goes to sleep and you wake it up. How rubbish is that? As far as I can tell – and please write in, dear readers, if I'm missing a trick – there's no way to make a setting stick or to alter the default.

▼ **Why on earth can't Android remember your chosen HDMI setting? Or maybe it can and I'm being a muppet...**



Last Year's Model

My computer's quite old and a fortnight ago the hard drive packed in. I've now replaced that and also upgraded from Windows XP to Windows Vista. I bought a salvaged product-key sticker off eBay (as recommended by you in a previous issue), and whilst Vista's running well and I've successfully got it activated, the Aero effects – the transparent borders and so on – are missing. In the display settings the Aero option isn't even shown. Any ideas? Could the provided DVD be the problem? It looks like a copy. The computer's specs are shown below.

CPU: Athlon 64 X2 3800+ (Socket 939)

Motherboard: Gigabyte GA-K8NF-9

RAM: 4 x 1GB DDR400

GPU: 128MB Matrox P650 (PCIe)

HDD: 250GB (SATA I)

ODD: 12x DVD rewriter (IDE)

OS: Windows Vista (Home Premium)

Harry, Gmail

There's nothing wrong with the DVD. Well, if it's a copy and the files were downloaded from a dubious source, it's true it could be teaming with infection, but that's a different matter. No, the Aero problem is caused by the Matrox P650.

You see, Harry, Matrox's driver (whether for Vista or any other Windows flavour) only supports XDDM – the Windows 2000 Display Driver Model (I've no idea what the

X stands for – perhaps Microsoft was trying to tie into the upcoming XP). For Aero, you need a driver that supports WDDM – the Windows Display Driver Model (confusing name, huh?). Your Vista installation has detected the type of driver and removed Aero as an option.

Now, you might think this is a poor show on Matrox's part. The P650 was launched during the XP era, in 2003, and it's not unreasonable to expect there to be proper drivers for the OS that followed directly after, in 2006. But there's more to it than that. The snag is that the P650's architecture, lifted from Matrox's doomed Parhelia cards, doesn't support Shader Model 2.0 (so there's no full DirectX 9.0

support, either). Aero needs this, as does WDDM. So you're sunk, I'm afraid.

Once upon a time Matrox was quite a force, even in the gaming world. By 2003 and certainly by 2006, however, its cards just weren't competitive. They continued to sell well to the CAD and Photoshop fraternities, though, as they offered superb colour accuracy and were at the forefront of multi-monitor technology. But AMD and Nvidia caught up years ago, so it's a mystery how Matrox is still in business. But still in business it is, and it actually makes a profit. Even AMD can't manage that.

▼ **The Aero interface in Windows may be old-hat now, but some users can't get it even if they want it**

| Download Type: | Operating system(s) supported: | Version name: |
|---|-----------------------------------|----------------|
| Drivers | Windows XP x64, Windows Vista x64 | 1.13.00.158 HF |
| Release date: | File name: | File size: |
| May 08, 2007 | v64_113_00_158_hf.exe | 13.6 MB |
| Matrox products supported: | | |
| Millennium P650 LP PCIe 128, P650, P650 Low-profile PCI, P650 LP PCIe 64, P650 PCIe 128, P750, Parhelia 128MB, Parhelia 256MB, Parhelia 256MB PCI, Parhelia APVx, Parhelia DL256 PCI, PJ-3OLA, PJ-4OLA | | |
| Notes: | | |
| Notes and known issues: - Please uninstall your current drivers using Microsoft Add/Remove Programs before installing the new drivers. Do not uninstall your current drivers if you have Matrox RT2500, Matrox DigiSuite or Matrox Imaging products installed in your system. - The above driver is an <u>XDDM/Vista compatible driver.</u> | | |

Crowdfunding Corner

Having lots of mobile gadgets in your life means that increasingly you have to carry around multiple accessories for them. Here's a pair of devices that try to change that

Z Cables

Ever felt annoyed that you need different cables for adding USB ports, providing flash storage and charging/syncing your phone or tablet? Well, so does Smart QI Power, which is what has motivated it to come up with a solution: a cable that combines multiple accessories. It may not be the most revolutionary idea, but it's hard to call it a bad one.

The Z-Cable incorporates a charge cable, sync cable, flash drive and USB keyboard adaptor into a single device. This means that not only can you use your desktop keyboard with your Android or iOS phone, you can access extra storage too – all while charging and syncing as normal. The devices have intelligent controllers built in, which allow Android devices to read the flash drive as well as PCs. The Z-cable's USB port has a 500mAh power output, so you can even run a wireless keyboard receiver off it.

Early Bird Backers can get a cable with no SD card for as little as \$14 (£8.80), but if you miss that, it's not much of a leap to the full-price \$15 (£9.50) option. You can pay more to get an SD card, and all tiers add \$5 (£3) for a Lightning converter for iPhone compatibility, and \$4 (£2.50) international shipping. The only real problem is that you won't get the cable until October according to the production plan – and for something this practical that's quite a wait!

URL: kck.st/1EFSJGB

Funding Ends: Thursday, 4th June 2015

Mr. Everything

If you think you've seen all-in-one docking stations before, think again. Mr. Everything lives up to its name in ways you haven't even imagined. How, exactly? Well, it can jump start a car, for one thing.

Admittedly, this functionality isn't the real selling point, but it's impressive nonetheless. Other features include charging capabilities for multiple devices, a utility box for cables and cords (or anything else you want to store), LED flashlight, a pair of Bluetooth speakers and water-resistant casing. If you go for the Mr. Everything Plus version, you even get a universal AC power outlet that fits devices from any country.

It's hard to list the many ways you could use this device, but it's clearly intended to be taken out and about, and that's why it has a built-in carry handle and rugged exterior. All this functionality doesn't come cheap: it's \$249 (£158) for the standard unit and \$349 (£222) for the Plus version, but those prices are still \$100 (£63) off retail, so it's not like you don't save a fair amount.

The project is aiming for \$100,000, and at time of writing it's a third of the way there with a month to go, so it's likely it's going to succeed. Still, if you like the idea, better get in sooner rather than later. It ships November 2015, so make sure you're in the first group and back it today.

URL: kck.st/1JIQ4jH

Funding Ends: Monday, 15th June 2015



Disclaimer: Images shown may be prototypes and Micro Mart does not formally endorse or guarantee any of the projects listed. Back them at your own risk!

App Of The Week

Wuaki.TV

We check out some streaming content on the TV this week

We recently bought ourselves a new (for us anyway) smart TV. With it came all manner of WebOS apps, which included BBC iPlayer, Demand 5, Netflix and an app that connected us to our NAS drive to access our stored content. It's all quite amazing and it works extremely well.

But we were only scratching the surface of the available apps, and we've since sat down and gone through a selection of what's available from the LG Store, where we discovered Wuaki.TV.

Admittedly, we don't watch a huge amount of TV – it's films mostly and occasional boxsets of series we like. We've had Netflix in the past, but once we'd run out of decent stuff to watch, it soon lost its appeal. Wuaki.TV we thought would be much the same, but it has turned out to be quite different in its approach.

Wuaki.TV

Wuaki.TV is a Rakuten-owned company, the same company behind Play.com and so on. Although it's quite new to the UK audience, it has, in the last year or so, gained quite a following.

It doesn't work in a subscription format (it used to, but late last year it closed down the subscription service), and instead it concentrates its service on delivering rental and purchase options.

The prices are quite good too. Standard definition films can cost as low as £2.49 and high-definition rentals from £3.49. The purchase price isn't too bad either, from £4.99 for SD quality, to £14.99 for HD quality.

You'll also get films that aren't released on DVD yet or that have only been available for mere weeks. The likes of *The Theory of Everything*, *Big Hero 6*, *Fast and Furious 7* and even *Fifty Shades of Grey* (if you're into that kind of thing) are available to rent in HD quality for less than a tenner.

On renting a film, you have 48 hours to watch it from the moment you confirm the rental agreement, and you can watch

it as many times as you like within that time period. If you opt to purchase a film, then you effectively own it for a period of three years, during which you can watch it as many times as you like. There are even a few films available that can be owned for longer, depending on the agreement from the studio that owns the copyright. In any case, Wuaki.TV will leave the film in your digital library for as long as they are allowed by contract.

In terms of the quality of the streaming, we didn't have any issues whatsoever. The HD content is true HD and not a rough estimate as some streaming media sites claim, but you will need a fairly decent broadband connection to get the best streaming service without buffering issues and so on.

Conclusion

It's not just film, though; you can rent or buy TV shows in entire seasons, and you get a wealth of free content to view as well.

Most people don't like subscribing to online services, and in the past some preferred the act of walking into a video shop to browse the shelves and find something to watch for a rainy weekend. In many ways, Wuaki.TV brings back that feeling: you can take what's on offer in your own time.

Yes, there are many other streaming services available these days, but Wuaki.TV isn't a bad choice if all you want is a good quality film without the hassle of signing a contract.

Features At A Glance

- Watch new releases before DVD.
- Good HD quality and streaming.
- Android and other device compatible.
- Loads of TV series and entire seasons available.



▲ One of many streaming services now available, and one that seems like a good choice



▲ Wuaki.TV has a grand selection of films and TV series on offer, for a reasonable price too

Logging Off

It's taken a while, well seven years to be precise, but Microsoft has finally called time on Media Center. Somewhere I've still got a small computer with the Media Center Edition (MCE) of XP installed on it, although as I recall, the interface was never actually used.

The alternative control system designed for the remote control of a PC attached to a TV first appeared in 2002 and became part of Windows XP MCE 2005. It then was subsequently bundled both

with Vista and Windows 7, for the relatively small number of people who found a use for it.

You could also get it for Windows 8, though Microsoft had the temerity of charging for this extra, even though it had actually stopped developing the tool in 2008.

It won't be in Windows 10, although, I'm sure some bright spark somewhere will bundle up the necessary files and create a script to install it. Or, ideally, Microsoft could make it open source.

The end of MCE says more about the changing role of the PC in our homes and that environment than it does about this particular software tool. When it arrived building HTPCs was all the rage, and TVs at the time weren't really high enough resolution to use a desktop interface. Now TVs are not substantially different from monitors, and there are a million tiny devices that can play all media without resorting to Windows.

That hints at part of the problem that Windows 10 faces: in many respects, Windows is far too elaborate and complicated for many of the tasks it is used for. But then, ironically, it was when Windows XP came out. The only significant difference between now and then is that the alternatives exist now to do things using much less complicated systems.

In explaining its decision, it's worth pointing out that Microsoft's own research ahead of not bundling it with Windows 8 had concluded that very few people ran Media Center. And those that did often launched it by accident, and never subsequently. My own experience of this software was that it looked very nice, but it did relatively few of the critical jobs my media system performed.

Some of the missing launch features were eventually added, and the last release did include QAM, DVB-S and MHEG, but it seemed constrained by odd ideas that Microsoft had about policing its users.

A beta version of the code included the ability to handle H.264 encoded video, but it was removed, presumably at the behest of those

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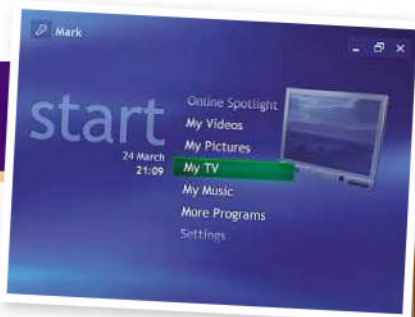
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beset by film piracy. This sort of thinking sealed its fate, because users did use these formats, irrespective of Microsoft's support.

But there were also some technical reasons to avoid it, for those who weren't experts in combining complicated software and hardware. Getting early TV tuners to work with it could be an absolute nightmare, even if they were sold as being MCE compliant.

There was an attempt to splice it up to the Xbox 360 through the Windows Media Center Extender, but it all seemed rather cobbled together compared to other less restrictive tools.

In the end, I'd categorise MCE as a triumph of style over substance that was seen through rather rapidly by those who might have used it. The only conundrum is why it took this long to officially kill it.

Mark Dickavance

LAST WEEK'S CROSSWORD

Across: 1 Watt, 3 Ideal Gas, 9 Annuent, 10 Ounce, 11 Slacktivists, 13 Patent, 15 Swathe, 17 Indoctrinate, 20 Imbed, 21 Echelon, 22 Exccrate, 23 Stud.

Down: 1 WhatsApp, 2 Tonga, 4 Detail, 5 Atomic Weight, 6 GenStat, 7 Seek, 8 Pecking Order, 12 Demeaned, 14 Tenable, 16 Attest, 18 Allot, 19 File.

DISCLAIMER

The views expressed by contributors are not necessarily those of the publishers. Every care is taken to ensure that the contents of the magazine are accurate but the publishers cannot accept responsibility for errors. While reasonable care is taken when accepting advertisements, the publishers cannot accept any responsibility for any resulting unsatisfactory transactions. As you may have noticed, we had a general election recently. But regardless of who you voted for and whether they came out of on top, it's done and dusted now. So let's not think about that any more. Instead let's consider the burning issue of this week (for us, at least): we have nothing to watch. Yes, all our favourite TV shows have come to an end for the year, or will be by

next week. With only one show to watch in June, we're now faced with the very real prospect of having to do something else other than watching TV. It's a scary thought, but an exciting one. Perhaps we'll finally get time to read those classic novels that people at parties like to mention they've read because it makes them look clever. Or maybe we'll even attempt to write one ourselves, so we can explore our creative side and perhaps write the next 50 Shades of Grey (but with less naughty bits and more writing like an adult instead of a drunk teenager). There's even a chance we could do something that involves going outside moving around. Of course, we could always just look at an on-demand service and find something new to watch instead...

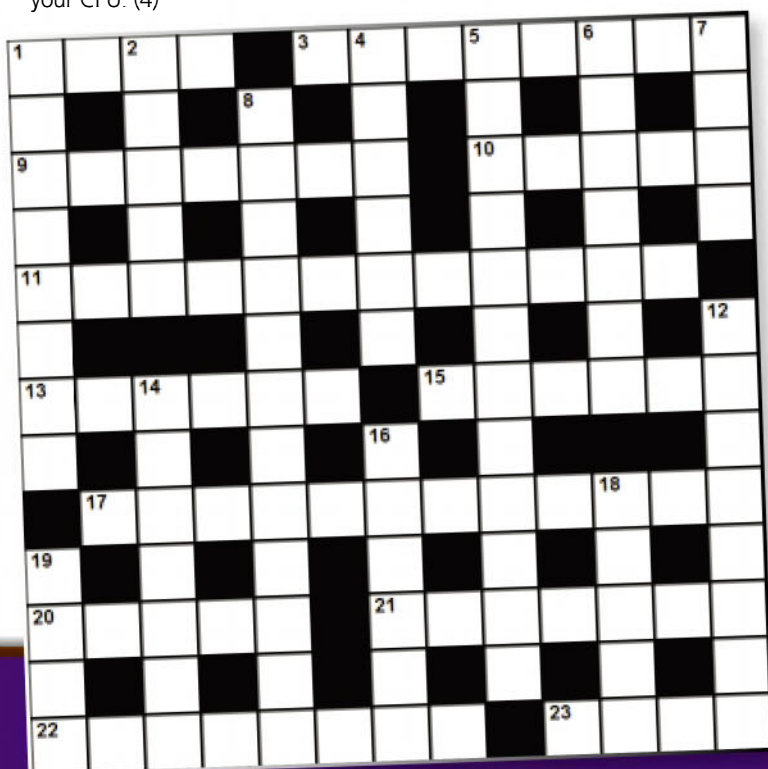
THIS WEEK'S CROSSWORD

Across

- 1** Graphic file format originally developed by Aldus and Microsoft. (Acronym) (4)
3 Someone with great talent whose career progresses rapidly. (5-3)
9 A small quantity of a particular thing, especially something desirable or valuable. (7)
10 Become ground down or worn. (5)
11 Instruments that block out light emitted by the sun's actual surface so that its outer atmosphere can be observed. (12)
13 A machine for converting mechanical energy into electrical energy, typically by means of rotating coils of copper wire in a magnetic field. (6)
15 A permissible difference; allowing some freedom to move within limits. (6)
17 Pots of cash available to invest in companies or properties that are performing poorly and may therefore be undervalued. (7,5)
20 The winged nymphs of the breezes, daughters of Boreas, the god of the north wind. (5)
21 The act of obtaining unauthorised access to a computer or network. (7)
22 Pleasing in appearance, especially by reason of conformity to ideals of form and proportion. (8)
23 Too much of this can damage your CPU. (4)

Down

- 1** Standardised frame identification used in video editing or electronic indexing. (8)
2 A device for varying the volume of sound, the intensity of light, or the gain on a video or audio signal. (5)
4 The formal oath of a vassal to honour his or her lord's rights. (6)
5 The splitting of a spectrum line into several components by the application of a magnetic field. (6,6)
6 Technical knowledge or skill required to do something. (7)
7 Rectangular pieces of semiconductor wafer. (4)
8 The application of mathematics and statistics to the study of economic and financial data. (12)
12 Normal use of the faculty of vision. (8)
14 A subatomic particle of about the same mass as a proton but without an electric charge, (7)
16 A number used in securities investing that measures a stock's so-called fair value. (6)
18 Showing a lack of experience, wisdom or judgement. (5)
19 The full name of the location of a file on a computer, including the names of any directories or subdirectories. (4)



In Next Week's Micro Mart*

- How to fix broken files, from pictures to MP3s and videos
- Can online region hopping get you into legal trouble?
- We spend a week with Android Wear
- Plus the usual mix of news, reviews and advice



* May be subject to change

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